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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service
Office of Administrator
Washington, D. C.

REPORT OF THE FIRST MEETING OF THE
OILSEED, PEANUT AND SUGAR CROPS RESEARCH ADVISORY COMMITTEE

January 27-30, 1964
Washington, D. C.

Membership of the Committee

Mr. Samuel Aronoff, Vice President, Cargill, Incorporated, Minneapolis
Minnesota

Dr. Leonard D. Baver, Consulting Scientist, Experiment Station, Hawaiian
Sugar Planters Association, Honolulu, Hawaii

Mr. Sherwood R. Baxley, Vice President, Peanut Purchasing and Shelling,
Tom Huston Peanut Company, Columbus, Georgia

Mr. Franklin A. Beale, Central Aguirre Sugar Company, Aguirre, Puerto Rico

Mr. Mark R. Berrett, Director of Research, Farmers and Manufacturers Beet
Sugar Association, Saginaw, Michigan

Mr. John B. Boy, Executive Vice President, United States Sugar Corporation,
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Mr. Jacob Hartz, Jr., Manager, Jacob Hartz Seed Company, Inc., Stuttgart,
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Mr. Gordon H. Miller, President, National Beet Growers Federation, Grandview,
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Mr. B. Regnar Paulsen, Woodland, California

Mr. Glen H. Pogeler, General Manager, North Iowa Soybean Cooperative,
Mason City, Iowa

Mr. Guy O. Rorabaugh, Vice President in Charge of Operations, Holly Sugar
Corporation, Colorado Springs, Colorado

Mr. Burton Scott, Binger, Oklahoma

Mr. Carl L. Stenhjem, Kindred, North Dakota

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PREFACE

The first meeting of the newly constituted Oilseed, Peanut and Sugar Crops Research Advisory Committee was held in Washington, D. C. on January 27-30, 1964, with all members of the Committee present. The Committee made a systematic review of the Department's oilseeds, peanuts, and sugar research program. The primary basis for this review was the Oilseeds and Peanut; and the Sugar Research Progress Reports prepared for the Committee's use. This source of information was supplemented by oral reports from the following USDA Research Divisions: Crops; Entomology; Agricultural Engineering; Eastern, Northern, Southern, and Western Utilization Research and Development; Human Nutrition and Consumer Use; Market Quality; Transportation and Facilities; Marketing Economics; Economic and Statistical Analysis; and Marketing (FCS).

Additional information was presented regarding research needs in the oilseed, peanut, and sugar industries at the Public Session Meeting on January 27, 1964 by the following persons: Mr. James H. Fischer, Secretary-Treasurer, Beet Sugar Development Foundation, Fort Collins, Colorado; Mr. Dudley Smith, Vice President, Association of Sugar Producers of Puerto Rico, Washington, D. C.; Dr. W. W. Cravens, Chairman Soybean Research Council, Chicago, Illinois; Mr. Robert W. Judd, Director, National Soybean Crop Improvement Council, Urbana, Illinois; Mr. George M. Strayer, Executive Vice President and Secretary-Treasurer, American Soybean Association, Hudson, Iowa; Mr. Roland R. Becke, Executive Secretary, American Tung Oil Association, Poplarville, Mississippi; Mr. Francis Scofield, Technical Director, National Paint, Varnish, and Lacquer Association, Washington, D. C.; Mr. C. E. Morris, Director of Research, National Flaxseed Processors Assn., Chicago, Illinois; Mr. Joe S. Sugg, Executive Secretary, North Carolina Peanut Growers Association, Rocky Mount, North Carolina; Mr. Sydney C. Reagan, General Counsel, Southwestern Peanut Shellers Association, Dallas, Texas; and Dr. C. T. Wilson, representing the Southeastern Peanut Growers Association.

The Committee expresses its appreciation to the Department for permitting industry representatives to appear at the public session and to present their views on the research needs in the oilseed, peanut and sugar industries. It also commends the Department scientists and administrators for the effective presentation of their research programs.

Dr. Nyle C. Brady, Director of Science and Education, Office of the Secretary, USDA is Chairman of the Committee; and Dr. G. W. Irving, Jr., Deputy Administrator, Agricultural Research Service, USDA, is Vice Chairman.

After a careful review of all the material available, the Committee submitted the following recommendations to the Secretary of Agriculture.

Additional copies of this report may be obtained from James F. Lankford, Executive Secretary of Oilseed, Peanut and Sugar Crops Research Advisory Committee, Office of Administrator, Agricultural Research Service, U. S. Department of Agriculture, Washington, D. C.

REPORT AND RECOMMENDATIONS

GENERAL COMMENTS

The Committee again places major emphasis on the need for the Department of Agriculture, the Land-Grant Colleges, and the agricultural industries to develop a public relations program that will create in the minds of the American public a true image of agricultural research. The majority of the farmers on the land, as well as the processors of their products, are not fully cognizant of the debt they owe to research for their existence and livelihood; the business man and the industrialist are oblivious to the impact of agricultural research on the growth and prosperity of the nation; the American consumer has no idea that he is the world's best fed individual only because of agricultural research; all of America, from farmers to lawmakers in the Congress, does not realize that research has raised the United States to the pinnacle of world leadership in agriculture. America has been able to enjoy these manifold blessings from its land resources and achieve world leadership in agriculture only because of the high quality of agricultural research in the past. The progress has been rapid and the cost relatively low in terms of the overall benefits derived. America will maintain this leadership and its people will continue to have the present high standards of living provided that agricultural research is strongly supported in the future.

The Committee has had the privilege of hearing the story of the need for increased research from industry representatives. It has reviewed the Progress Reports and proposals of Department scientists. It has participated in a review of the current research program of the Department as it relates to problems of the producer, the processor, and even the consumer. Every member has been impressed by the need for both the expansion of current work and initiation of new projects, particularly in the area of basic research. This fact will be highlighted from the specific reports contained herein.

The Committee commends the Department for the quality of basic research it is now conducting in areas relating to farm research. However, it finds that the funds available to the Department for discharging its primary function in agricultural research, that is, an attack on the fundamental aspects of the many problems involved, are too meager to accomplish the objectives. In too many instances, there have not been sufficient funds to lay the foundations of basic research, let alone making contributions to the solution of the problems involved. Moreover, the uncertainty of funds make it most difficult to keep important and productive projects operating at optimum efficiency.

The Committee recognizes further that even though these aforementioned thoughts have been expressed in its reports of prior years and recommendations made, there has been too little implementation of the

recommendations in terms of the research program. It cannot overstress its concern in this regard.

The Committee feels that it is mandatory, from the standpoint of the producer, the processor, the consumer, and the nation at large, that costs of production be decreased and the quality of the product increased through augmented support for fundamental studies on farm research projects. It cannot understand why oilseeds, peanuts and sugar crops, that represent such a large and widespread acreage, such a high dollar value and such important food items to the American consumer, are so inadequately funded in the Department's 1964 budget as to provide only about 129 man-years for farm research. The Committee, recognizing the many problems in obtaining funds for the Department, recommends that steps be taken at every given opportunity to correct these deficiencies in appropriations for basic research.

There are many examples of the success of coordinated research attacks on agricultural problems by the Department and the Land-Grant Colleges along with the participation of agricultural industries. The Committee feels that the potentials involved in such coordinated research in oilseed, peanuts and sugar crops have not been adequately exploited. It recommends, in the spirit of getting the maximum returns from each research dollar, that within a given region, appropriate steps be taken by the representatives of industry, the State Agricultural Experiment Stations and the Department to explore fully the possibilities of more highly coordinated research programs, involving both basic and applied research. It suggests the possibility of grass-root meetings on the regional level as a catalyst to achieve these objectives.

FARM RESEARCH

A. Culture, Breeding, and Variety Evaluation

Sugar Beets: By official action the legislative and executive branches of the Federal Government have established as a national sugar policy a greater reliance on domestic sugar production. As a result of this policy, widespread interest in expanding production in established areas as well as in new areas is in evidence. This policy has intensified the need for an expanded research program, particularly farm research. It also points to the fact that a previously marginal research program has now become very inadequate. The situation is illustrated by the fact that the number of technical personnel assigned to Sugar Beet Investigations is only 60 percent of the number assigned 25 years ago.

The sugar companies and the State Experiment Stations have in the past and will continue in the future to take care of the necessary applied research on the problems of most immediate concern to the growers and processors in their respective areas. It is recommended by the Committee that the Department of Agriculture join with the industry,

particularly in the area of basic research, to help the growers and processors meet the increased demand for domestically produced sugar, a commodity which is not in surplus.

Breeding for varietal improvement has been and continues to be of great importance in increasing the production of sugar. Some of the aspects of sugar beet variety improvement that need additional basic research are (1) male sterility, the genetic mechanism which permits the production of hybrid sugar beets, (2) polyploidy, a breeding technique from Europe that has the possibility for both yield improvement and disease resistance, (3) interspecific crosses to utilize sources of resistance to insects, diseases, nematodes, and soil organisms, (4) factors influencing bolting, a reproductive process necessary for seed production, (5) factors influencing seed germination, (6) physiology of the sugar beet and its association with the multitude of factors affecting quality and (7) biochemical studies associated with disease resistance.

It is readily apparent that basic research work in these areas requires a team approach by geneticists, plant physiologists, bio-chemists, pathologists, and entomologists.

Sugarcane: Breeding for varietal improvement continues to be the most important approach towards increased yields per acre, improved factory yields per unit processed, cost reduction through varieties better adapted to mechanization, and disease and insect control through greater resistance. Breeding improved varieties in both sugar cane and sugar beets should remain of utmost importance in research programs.

The Committee commends the efforts of the Department of Agriculture in attempting to utilize to the fullest the sugarcane breeding program at Canal Point, Florida by making this center a multi-purpose breeding station where varieties that might not be adapted to Louisiana are evaluated for possible use in Florida or Puerto Rico. These efforts should be continued and intensified. To adequately serve this effort, the physical facilities should be materially expanded.

With the increasing importance of the domestic sugar industry, overall efforts in the field of sugarcane and sugar beet breeding must be expanded. Sugarcane varieties have a narrow adaptation range and varieties adapted to specific soil types, local climatic factors, special drainage and cold weather situations, and the like are possible with an expanded breeding program. The same situation applies for sugar beets. In this connection, more emphasis must be given to the nutritional requirements of different varieties; this includes both sugarcane and sugar beets.

Soybeans: Soybeans have been in production in the United States for forty years, but average national yields have never exceeded 25 bushels per acre. In the past 23 years the average per acre yield has only increased 17% compared to corn yield increases of 53%.

A new appraisal of production research needs is recommended now. The rapid expansion of soybean production has been accompanied by an intensification of soybean insect and disease infestations. Major research efforts, in a properly financed program, should be directed toward problems anticipated in the future. The available scientific efforts in soybean research have been concerned by necessity, with problems which require almost fulltime effort to find an immediate solution. Practical, everyday problems must be solved, but resources should be available at the same time for anticipated future needs. Analytical research is needed to identify the main factors limiting soybean yield. Optimum conditions have not been determined for the multitude of factors influencing yield. These factors probably involve utilization of nutrients, utilization of water, utilization of light, diseases, and insects. Soybean yields achieved in grower competition have reached a plateau. The yield barrier can be broken only when the obstructing cause is known.

One of the greatest needs of the soybean industry today is for intensified breeding work, especially at the stations located in the different production areas. The objective should be aimed at keeping the United States ahead of the world in soybean production during coming decades.

The fundamental basic research in the physiology and nutrition of the soybean plant has not been made. Many unanswered questions as to why the crop does not respond to fertilizer, what are the moisture requirements, what affects nodulation, what retards yields, and how does the plant convert energy into oil and protein are unanswered fundamental questions. To produce the quantity of soybeans for the ever expanding oilseed needs of the world, these questions must be answered.

Peanuts: The Committee is concerned over the wholly inadequate peanut research program being carried on by USDA. This decision is based on materials supplied to the Committee by USDA, and statements presented before the Committee by members of the Peanut Industry.

In all areas of farm research on peanuts, the Committee recommends that the USDA give special attention to the acute problems existing within each of the three producing areas in basic research and conduct the research in the area where the problem exists. However, we recommend that the research be so conducted and coordinated so as to have no duplication within the areas.

At this date no varieties have been developed that have the essential characteristics for mechanical harvesting. There is no known variety or strain known to be resistant to nematodes and/or most of the diseases attacking peanuts. We urge USDA to implement programs to solve these

problems by use of natural and/or artificial hybridization combining desirable characters of several accessions and determining the mode of inheritance by contrasting genetic characters not previously established; also, to develop new varieties, using, where indicated, pedigree, backcross and recurrent selection methods. We must state the number one objective in peanut breeding should be in the direction of higher quality, not necessarily for higher yield, but yield is important.

In this area of research a better variety of Runner peanut is needed, particularly one which will be more easily and completely blanched. There is also a need for the development of a Spanish type in the Southwest, which has a lower linoleic acid content. Such a peanut would be more flavor-stable for the end user. The Committee believes that the work in this area is much too small.

The fundamental physiology and biochemistry, particularly in Runner and Spanish types, must be done to provide basic information for sound production and fertilization practices. Moreover, the environmental factors affecting the physiology of the peanut plant need to be evaluated for the different ecological conditions found in the three peanut producing areas. This is very important as to the effect of soil and air temperature, light, soil moisture, atmospheric humidity, and mineral nutrition on growth and development of the plant. The desired result of this study should be to lead to complete and equally matured peanuts.

Flax: Considerable potential yield gains based on genetic factors are possible through continued screening of the World Flax Collection. These studies should be augmented.

There is need for a study of the effects of environmental factors on the growth of the flax plant. For example, what are the effects of moisture, temperature, light, fertilizer applications, rate of seeding, type of soil, etc. on the development of the flax plant? How can these factors be correlated with varieties responsive to each optimum condition.

One practical benefit which might be derived from such a study is based on the fact that much flax is raised in areas often deficient in soil moisture and where rainfall during the growing season is uncertain. The development of improved varieties capable of withstanding droughty conditions with minimum ill effects will materially improve yields in these areas. Similarly, the development of new rapidly maturing varieties could be of great benefit to producers.

Work should be continued in the field of fertilization. To date no effective method has proven successful in increasing yields through use of fertilizers and in order for flax to hold its own economically an increase in yield is very necessary - per acre income to the farmer is not very attractive due to its unstable yield.

B. Diseases

Sugar Beets: Diseases continue to be a major hazard in all areas of domestic sugar production. Basic studies on disease causes, transmission of viruses and identification of new strains of viruses should be intensified. This fact is exemplified by the fact that even though in recent years the level of varietal resistance to curly top has been adequate, new strains of this virus have been identified which are apparently more virulent. Consequently, more resistant breeding lines of sugar beets need to be found.

Virus yellows is of great economic importance in California and the disease is also evident in the Pacific Northwest and the Intermountain region. The vector of this virus, the green peach aphid, is found in most areas where sugar beets are grown. Beets infected with virus yellows may also be attacked by the curly top virus and vice versa. The damage from the two viruses is additive. The geographical areas affected by these virus diseases and the presence of the insect vector in other areas points up the need of an expanded basic research program.

Present levels of varietal resistance to *Cercospora* leafspot and black root diseases need to be raised. These are the primary diseases in large areas of present sugar beet production and would also be a problem in some of the new areas interested in sugar beets.

The work on *Rhizoctonia* root rot should be continued.

Sugarcane: Sugarcane disease problems continue to retard maximum sugar production in all areas. Although resistant varieties have helped to reduce possible losses, new strains of viruses and other pathogens are appearing that could cause large losses. As new areas are developed for sugarcane, these problems are likely to become more serious.

Basic research on plant diseases of sugarcane should involve an evaluation of all possible approaches. In addition to the breeding of resistant varieties, this should involve the use of fungicides, the possibilities of systemics, cultural practices and rotations, and the like.

Flax: A new race of flax rust (race 300), first observed in the vicinity of Morden, Manitoba, has spread into North Dakota. This race attacks varieties carrying the L resistant gene which heretofore conditioned immunity from all known North American races of flax rust fungus. As a result, only a few commercially available varieties are now rust resistant.

There is also the ever-present danger that new mutations of the rust fungus may appear which can attack these varieties which are presently resistant.

The urgent need exists for additional plant pathology studies to supplement the work now in progress. This is so important that it should be considered as a crash program. Continuing studies on other flax diseases are also needed. Pasm, Fusarium Wilt, Crinkle Disease, Aster Yellows, to mention a few, all pose a continuing threat to the flax crop which cannot be ignored. One need hark back only to 1957 when aster yellows reduced yields severely to observe the ravages of just one of these diseases.

C. Insects

Sugar Beets: The Committee recognizes the excellent work that has been done in the field of sugar beet insect control but, at the same time, points out the need for additional work in this area. The control of insects is imperative not only because of the damage they do directly to the plant, but because of the diseases that are transmitted by certain insects. More information is needed on the biology and ecology of these insect vectors and the control of the insects either by insecticides or other means.

Sugarcane: Basic research on insect problems involving sugarcane should continue to be emphasized. This includes studies of the development of resistance to commonly-used insecticides, the residue problem, the effect of insecticides on beneficial insects and wildlife, and the transmission of plant diseases by insect vectors. The continued buildup of resistance of many insect pests to the commonly used insecticides and the accumulation of residues lead to the conclusion that in the long run major insect problems will most likely be solved by approaches other than the use of insecticides. Although insecticide approaches should not be abandoned, major emphasis on basic research should be in the area of biological controls, attractants, and repellants, sterilization approaches, and the like.

Soybeans and Peanuts: The effect of stink-bug feeding on soybean quality and the development of resistance to chlorinated hydrocarbon insecticides by the southern corn rootworm on peanuts are problems that may best be solved by developing insect-resistant varieties. Research in cooperation with plant breeders should be expanded to develop varieties of soybeans resistant to stink bugs and varieties of peanuts resistant to the southern corn rootworm, and other promising lines should continue to be explored. The use of insecticides is necessary and often the only way to combat insect outbreaks on soybeans and peanuts, but some very effective materials cannot be recommended because of excessive residues. Increased research effort is needed to develop safe, effective chemical control methods, and to investigate biological and cultural methods.

D. Nematode Control

Nematodes are becoming more important in the production of all crops with which this Committee is concerned. The work on improving the varietal resistance to this pest needs to be strengthened. Other methods of nematode control should continue to receive attention.

E. Weed Control

One of the greatest problems in the production of oilseed, peanut and sugar crops is weed control. For example, grasses and weeds in the production of soybeans, flax, and other oilseeds present more problems, reduce more yields, and increase production cost more than any other item. Weed control is the major stumbling block remaining in the elimination of hand labor in sugar beet production. In the production of sugarcane, the control of weeds is both a costly and a time consuming operation.

While the Committee is aware of the excellent work that is being done by the Weed Investigations Branch, it feels that increased basic research is urgently needed. The integration of newly developed chemical weed control materials and methods with present cultural practices should be the responsibility of the state experiment stations and the sugar beet industry in the respective production areas,

F. Agricultural Engineering

Sugarcane: The committee feels that the problem of Sugarcane Harvesting Equipment is one of the most important problems facing the domestic sugar industry today. This committee strongly suggests that the present small program now in operation in respect to sugarcane harvesting equipment be sharply increased as the need for this equipment is acute. This committee is gratified that the Federal and Industrial Committees on cane harvesters have been formed and are now functioning as recommended in last year's report.

Considerable work on harvesting equipment and methods has been done by private industry in certain areas where recumbent, lodged, and high tonnage cane is now grown. These efforts should be evaluated. Also, other areas where this type of cane is now prevalent should be studied. Once this is done the Federal Committee personnel, together with local area industry committee personnel, would be able to make recommendations for the development of harvester equipment and methods applicable to the various conditions in our domestic sugar areas. The effect of this development of adequate harvesting equipment for our domestic sugar areas will tend to increase our national production, stabilize the sugar price to the consumer and insure that sufficient labor will be available to grow and harvest a maximum crop of sugar each year.

The committee also proposes that P. L. 480 funds continue to be used for cane harvester development in foreign areas. However, the use of these funds should be adequately supervised by Federal personnel connected with harvester development.

This committee wishes to bring to the attention of all concerned that the development of harvesting equipment and methods are especially important in the mainland cane areas and Puerto Rico at this time as the labor situation is very critical.

Peanuts: The Department of Agriculture and this Committee recognize the need to continue and intensify its basic research for the cause and cure of mold problems occurring in many segments of agriculture, including peanuts.

The development of harvesting equipment that will make shorter the interval that peanuts remain in the windrow, thus subjected to weather hazards, could well prevent mold from occurring and preserve and improve quality.

There is much improvement to be desired in the digger-shaker operation. In many cases more than 10% of peanuts produced are lost in the harvesting period.

The development and improvement of machines to apply pesticides to both plants and soil are desired.

G. Other Oilseed Crops

The committee recognizes the importance of the other oilseed crops, including safflower, tung, and others. The general recommendations presented herein, where applicable, are intended by the committee to also apply to these crops.

NUTRITION, CONSUMER AND INDUSTRIAL USE RESEARCH

The program now being carried on for the commodities assigned to this committee should be continued. They are not being enumerated since the record is clear as to the programs now in effect.

Research shall be directed to attaining knowledge of the fundamental, chemical and physical properties, as well as of the chemical reactions they undergo in processing. It is recognized that although direct product research, as such, is not included herein, the knowledge so obtained could be applied to the development of new and improved products for ultimate consumers.

Basic research is needed on composition and improved analytical methods for oilseeds, peanuts, sugarcane, and sugar beets and their derived products.

In addition, research should be initiated or intensified in the areas of:

LINSEED OIL

1. Basic studies on linseed oil in water systems, both solutions and emulsions. Such basic research should be expanded and intensified

in order to provide more rapid solution of problems in this area. Although emulsion and water-soluble vehicles from linseed oil are now commercially available, improvements in their properties are needed to insure maximum consumer acceptance and to meet continuing competition from synthetics.

2. Development of new industrial products from linseed oil. The Department's basic studies have led to the discovery of new classes of cyclized materials that have potential industrial value and require expanded evaluation and process development.

3. Expanded basic and exploratory research in the areas of copolymerization and isomerization to provide improved characteristic protective coatings.

4. Color retention and durability of linseed oil protective coatings. A program of basic studies should be initiated to obtain more information on the autoxidation of linseed oil and chemical modifications thereof, on the mechanism of formation of polymers and their subsequent crosslinking to solid films during oxidative drying and on the chemical and physical factors involved in deterioration and color change in plain and pigmented films.

SOYBEANS - FEED, FOOD, AND INDUSTRIAL USES FOR MEAL AND PROTEIN

Improving Nutritional Value of Food and Feed Products from Soybeans

Basic research on the composition of soybeans should be expanded to provide increased knowledge of the identity and chemical and physical properties of biologically active components, of their effects on growth response and other nutritional characteristics, and of their fate during various operations used in processing soybeans into food and feed products.

Components of Soybeans Affecting Their Acceptance in Food Products

Basic research should be expanded to provide more knowledge of the identity and chemical and physical properties of flavor components of soybeans and processed products such as full-fat and defatted flours and soybean beverages and to elucidate processing factors that affect flavor and palatability. This information will serve as the basis for development of improved processing methods to produce improved soybean food products.

Use of Soybeans as a Source of Dietary Protein for Foreign Markets

Expanded research is needed to evaluate soybean food products for nutritional value and consumer acceptability and for stability of desired qualities under adverse conditions that could occur during transportation and storage, and to determine the effects of processing variables on the performance of the products.

Stabilization of Soybean Protein for Use in Industrial Products

Preliminary research has shown that simple chemical treatments of soybean protein give products that retain desired properties and that can be protected from deterioration by common fungicides that cannot be used with native protein. Additional basic information is needed on chemical reactions of soybean protein to block or deactivate chemical groups sensitive to aldehydes, phenols and other fungicides. Studies are needed on how molds affect the utilization of soybeans.

SOYBEANS - FOOD AND INDUSTRIAL USES FOR SOYBEAN OIL

Basic Studies on Autoxidation of Soybean Oil

Basic research is needed on the mechanism and control of the reaction of soybean oil and its component fatty acids with air and oxygen and on the identification of the products of this reaction and their effects on stability of the oil.

Development Studies on Aldehyde Oils

Because of their unusual chemical structure and reactivity, expanded research is needed to identify and evaluate all possibilities for industrial utilization of aldehyde oils.

New Routes to Dibasic Acids

Basic research should be expanded to find new reactions and processes for converting polyunsaturated fatty acids to dibasic acids.

Peanuts, Oil and Meal: Increased utilization of peanuts and their products can only be obtained through knowledge of their fundamental chemical and physical properties as well as of the chemical reactions they undergo in processing. Thus, the following new or intensified research recommendations are considered critical:

1. Definition of quality of peanuts in objective terms including chemical, physical and microbial.
2. Instrumentation for the measurement of quality characteristics.
3. Relation of carbohydrate and protein components to aroma and flavor.
4. Molds as they affect the utilization of peanuts.
5. Interrelation of cultural harvesting and curing practices and processing on the flavor, aroma, color, texture and nutritive qualities.

TUNG

Composition of Tung Oil

Research needs to be expanded on the analysis of major glyceride components of tung oil which have to date been unresolved.

To the analysis for naturally occurring minor constituents which have a significant influence on their use for industrial purposes and basic chemistry of the major components of tung oil.

Improved Needs for Tung Nuts

Research to isolate and characterize the constituents in tung meal is vital to the development of improved feeding value of tung meal and should be expanded.

Industrial Products from Tung Oil

The unique characteristics of tung oil offer many opportunities for chemical modification to produce industrially useful materials for purposes other than protective coatings.

CASTOR AND OTHER WESTERN OILSEEDS

Composition of Vegetable Oils

Analysis of major glyceride components of castor, safflower and other Western oilseeds which have to date been unresolved.

Increasing Feeding Value of Oilseed Meals

Research should be expanded to isolate and characterize the constituents in oilseed meals from castor and other oilseeds, vital to increasing the feeding value of these meals. Methods for large-scale deallergenation of castorseed need to be developed.

SUGARCANE AND SUGAR BEETS

Chemical Composition and Physical Properties of Sugarcane and Sugar Beets

Increased knowledge of the composition of sugarcane and sugar beets and of the chemical and physical characteristics of all the constituents of juices extracted for processing is essential to accelerate all phases of research on uses of the crops. Research should be expanded on isolating identifying, and developing accurate methods for determining nonsugar constituents, including substances formed during processing, as a basis for improving sugar production. Research should be expanded on chemical changes in the composition of beet roots resulting from normal respiration, accelerated carbohydrate transformations response to environmental influences during holding of beets for later processing, and microbial action, are three important causes of sugar loss.

Improved Decolorization and Purification of Sugar and Sugar Solutions

Improved methods of decolorization and purification are needed to achieve greater efficiency and reduce costs in refining raw sugar and processing sugar sirups, with reduced refining or processing losses in production in higher quality sugar. Basic research should be initiated on the composition of sirups, and on chemical changes during clarification and other refining operations, as a basis for developing more efficient methods of economical production of high grade end products.

Improved Grades of Raw Sugar for Refining

Because of the rising costs of production and processing, it is imperative that more efficient methods be developed to increase the recovery of sugar upon which the returns of both processors and growers depend. Expanded laboratory and pilot-plant research should be undertaken to apply the available fundamental data obtained in studies on juice composition and changes during processing. Such information can be effectively used to develop better methods for the purification of juice and the production of improved grades of raw sugar and increasing the yields of recoverable sugar.

Relationship of Sugar Beet Composition to Processing Quality

In the past twenty years in many areas sugar beets have shown a decrease in sugar content, while non-sugar impurities have increased. This has resulted in a lower concentration of recoverable sugar in the diffusion juice and an increase in production costs and molasses yields. Studies should be expanded to correlate beet composition with processing quality and develop methods for rapid, quantitative determination of key constituents. Processing quality could be determined by chemical analysis of beet selection as an aid to geneticists in breeding beets to select the most promising new varieties as soon as possible after the crosses are produced.

New Processes for Sugar Beets

Research should continue on new economical unit processes for the removal of impurities not now removed by the present process. Removal of these impurities will improve sugar extraction and result in increased efficiency and increased returns for the sugar beet industry.

REPLACEMENT CROPS

Screening and Characterization of Wild Plants to Find New Oilseeds

The screening and characterization and uses for potential replacement crops considered so necessary to provide farmers with crops for increased acreage and for replacement of crops now in surplus. Expanded studies are needed to evaluate the amounts, types, structures, properties, and potential uses of polysaccharides from those species having favorable agronomic characteristics.

New Uses for Erucic Acid

Present industrial uses of erucic acid oils and erucic acid, which are presently imported, are limited. Now that a domestic crambe, a source of erucic acid, appears likely to become a new oilseed crop, considerable expansion in usage of erucic acid would be desirable. Expanded basic and exploratory research is needed to obtain more information on the chemical and physical properties and reactions of erucic acid and its derivatives.

Basic Studies on Crambe Abyssinica

Basic research to explore the physical and chemical properties and reactions of the unusual components of crambe oil meal should be expanded to provide a basis for the development of industrially useful products in addition to erucic acid, and a basis for developing improved processing methods for crambe.

Industrial Utilization

Prompt evaluation studies are needed on unusual fatty acids for industrial use from oilseeds having potential as replacement crops such as petroselinic acid from Umbelliferae, capric acid from Cuphea, and long chain unsaturated acids from Limnanthes.

Chemical Synthesis of New Derived Vernonia Products

A greatly accelerated and more elaborate program is needed for the preparation of new derived products from Vernonia oil and its chief components.

Uses for New Hydroxy-unsaturated Vegetable Oilseeds

Expanded research on applications and evaluation of these oils is needed in order to find new or improved large-volume industrial uses in resins, plastics, fibers, coatings, plasticizers, lubricants, surface active materials, and agricultural chemicals. The fatty acids contain chemically unique combinations of unsaturation and hydroxyl groups that will lend themselves to ready chemical conversion to new and useful compounds.

Feeding Value of Oilseed Meals

Exploratory research should be initiated on animal feeding studies to provide data on nutritional and protein value, essential amino acids, digestible carbohydrates, and growth inhibitors or promoters in meals obtained from all replacement crops.

MARKETING AND ECONOMIC RESEARCH

Objective Measurement of Market Quality

Soybeans: In the official grain standards of the United States for soybeans, foreign material is defined as all matter which will pass readily through a specified sieve and all matter other than soybeans that will not pass through the same sieve. Research should be expanded to develop a simple, practical mechanical method for making a quick, clear-cut separation of pieces of soybeans from true foreign material.

Peanuts: Better methods and equipment for evaluating quality objectively will aid in the improvement of grades and standards of peanuts by minimizing the element of human judgment in inspection and grading practices. Research should be expanded to provide simple, rapid, and inexpensive methods for sampling and quality evaluation of peanuts.

Flaxseed: The present methods of determining dockage in flaxseed involves a considerable amount of hand work in picking out that part of the material not presently removed by the dockage tester. Studies should be initiated on instruments or techniques to determine dockage in flaxseed. A rapid mechanical method to determine total dockage would reduce the time and expense involved in the method currently used.

Protection of Peanuts Against Insect Damage

Although the malathion treatment of bulk farmers' stock peanuts has been giving excellent results during the past several years, it is reported from Nigeria and more recently in the United States that one kind of beetle has developed strong resistance to malathion, and there are indications in this country that moths may be developing resistance to malathion. Therefore, increased effort should be devoted to the search for more effective protectants and to the studies of controlled atmospheres or hermetic storage for the protection of peanuts.

Effects of Stinkbug and Other Field Damage on Market Quality of Soybeans

Stinkbugs (Nezara viridula, Euchistus variolarius, Euchistus servus, acrosternum hilare) damage soybeans by transmitting a fungus through feeding punctures causing what is known as yeast spots. Stinkbug damage in soybeans has been known for many years, but it has not been a problem with respect to wide geographical distribution. Within recent years, as soybean production in southern areas has increased, the problem of stinkbug damage in soybeans has become more acute. A detailed study of the effects of stinkbug and other field damage on market quality of soybeans should be initiated to develop a more accurate assessment of damage.

Industrial Uses for Agricultural Products

Expanded research on market potentials for agricultural products and their derivatives in industrial, nonfood uses. The current level of market

potential research is far below that needed to provide adequate market information for the increased programs of physical science research on new products and processes in the Department. Research is needed to pinpoint market opportunities, establish economic parameters in terms of cost-performance requirements agricultural products must meet to maintain or gain markets, and to evaluate probable market size to guide commercial investment decisions.

Economics of New Crops

Research needs to be expanded on economics of new crops as part of the Department's new crops research program. The success of any new crop depends upon markets which can be realized for it. Therefore, products from new crops must satisfy market needs from the standpoint of price and performance. There needs must be identified and the conditions of acceptance must be defined to provide an economic base for the selection of crops with the greatest potentials for further development and field testing, as well as to provide guides for production, processing and marketing decisions.

Economic research is needed on the production and utilization aspects of minor oilseed crops such as castorbeans, safflower, crambe, sesame, and other minor oilseed crops. These are relatively new cash crops that offer an economic use to replace some crops now in surplus, such as cotton and feed grains.

Demand Base for Soybean Meal in Mixed Feed Rations

The inability to move excess stocks of soybean oil into marketing channels domestically and abroad is restricting the expansion of U. S. soybean production and farm income, and it is keeping the price of soybean meal to farmers high. The demand for soybean meal is greater than for oil and the gap is widening. Research should be conducted to determine the broad demand base for soybean meal in mixed feed rations through analysis of animal numbers, feeding rates, and related factors for both domestic and foreign markets. Knowledge should be sought especially of the potential limits for the demand for soybean meal in animal feeding, and the foreseeable demand potential for soybeans in American agriculture and the consequent size of the soybean oil supply. Additional analyses should be made to determine profitable ways of using substantially larger quantities of oil.

Analysis of the Economic Structure of the Peanut Industry with Respect to Supply and Demand

Research should be undertaken to achieve the following objectives:

- A. To determine the relationships between the present system of peanut grades and their end-use value and to propose improved grading systems.

- B. To determine the market structure, market performance and market conduct within the peanut industry.
- C. To evaluate market efficiency of the peanut industry in relation to pricing and performance of market functions.
- D. To estimate the potential demand for peanuts by use (i.e. peanut butter, salted, oil, candy, etc.) and consumption areas, including foreign markets.
- E. To estimate the quantities of peanuts of various types that would be produced in different areas and regions under selected economic and other environmental conditions as a comparison with the optimum.

Marketing Farmers' Stock Peanuts

There is a need to evaluate present and possible alternative methods of marketing farmers stock peanuts in all peanut producing areas.

Soybean Processing Cooperatives

Cooperative soybean oil mills face limited outlets for disposing of crude oil. Research is needed to determine the possibilities of further processing and what the advantages to growers might be. Involved is the question of whether the further processing should be done at a central location or at each crushing plant.

National Peanut Research Laboratory

The Committee wishes to reiterate the need for a National Peanut Research Laboratory in order that the factors which affect peanut quality and end use value can be studied; efficient economical methods can be developed to handle, store, process, and market the crop and increase consumption. All segments of the peanut industry, including farmers are concerned with quality problems. Certainly if the peanut industry is to remain prosperous--and advance to its full capabilities--it is necessary that immediate steps be taken to solve quality problems and other related factors.

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UNITED STATES DEPARTMENT OF AGRICULTURE
Washington, D. C. 20250

+ REPORT OF THE SECOND MEETING OF THE
OILSEED, PEANUT AND SUGAR CROPS RESEARCH ADVISORY COMMITTEE)

January 18-21, 1965,
New Orleans, Louisiana +

Membership of the Committee

- Dr. Leonard D. Bayer, Director Emeritus and Consulting Scientist, Experiment Station, Hawaiian Sugar Planters Association, Honolulu, Hawaii
- Mr. Sherwood R. Baxley, Vice-President, Peanut Purchasing and Shelling, Tom Huston Peanut Company, Columbus, Georgia
- Mr. Franklin A. Beale, Executive Vice-President, Central Aguirre Sugar Company, Aguirre, Puerto Rico
- Mr. Chester Biddle, Remington, Indiana
- Mr. John B. Boy, Executive Vice-President, United States Sugar Corporation, Clewiston, Florida
- Dr. J. Norman Efferson, Dean, College of Agriculture, Louisiana State University, Baton Rouge, Louisiana
- Mr. Jacob Hartz, Jr., Jacob Hartz Seed Company, Inc., Stuttgart, Arkansas
- Mr. Ray J. Lindquist, Jr., President, Minnesota Linseed Oil Company, Minneapolis, Minnesota
- Mr. Gordon H. Miller, Grandview, Washington
- Dr. John F. Murphy, Research and Development Center, Swift & Company, Chicago, Illinois
- Mr. Owen S. Rice, Santa Maria, California
- Mr. Guy O. Rorabaugh, Vice-President - Operations, Holly Sugar Corporation, Colorado Springs, Colorado
- Mr. Barton Scott, Binger, Oklahoma
- Mr. C. L. Stenhjem, Kindred, North Dakota
- Mr. Hassell Thigpen, Tarboro, North Carolina
- Mr. Aaron S. Yohalem, Senior Vice-President, Corn Products Company, New York, New York

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PREFACE

The second meeting of the Oilseed, Peanut and Sugar Crops Research Advisory Committee was held in New Orleans, Louisiana, on January 18-21, 1965, with all members present. The Committee made a systematic review of the Department's oilseeds, peanuts, and sugar research program. The primary basis for this review were the Oilseeds and Peanut Research Progress Report and the Sugar Research Progress Report prepared for the Committee's use. This source of information was supplemented by oral reports from the following USDA Research Divisions: Crops; Entomology; Agricultural Engineering; Northern, Southern, and Western Utilization Research and Development; Human Nutrition and Consumer Use; Market Quality; Transportation and Facilities; Marketing Economics; Economic and Statistical Analysis; and Marketing (FCS).

Additional information was presented regarding research needs in the oilseed, peanut, and sugar industries at the Public Session Meeting on January 19, 1965, by the following persons: Mr. Richard Blake, Executive Secretary, National Beet Growers Federation, Greeley, Colorado; Mr. James H. Fischer, Secretary-Treasurer, Beet Sugar Development Foundation, Fort Collins, Colorado; Mr. Phillip E. Jones, Secretary-Treasurer, U. S. Beet Sugar Association, Washington, D. C.; Mr. Hays Sullivan, President, American Soybean Association, Burdette, Arkansas; Mr. Robert W. Judd, Managing Director, National Soybean Crop Improvement Council, Urbana, Illinois; Dr. A. R. Baldwin, Chairman, Soybean Research Council, Soybean Processors Association, Minneapolis, Minnesota; Mr. Sam Aronoff, National Flaxseed Processors Association, Chicago, Illinois; Mr. Roland R. Becke, Executive Secretary, American Tung Oil Association, Poplarville, Mississippi; Mr. Joe Sugg, Executive Secretary, North Carolina Peanut Growers Association, Rocky Mount, North Carolina; Mr. W. J. McKemie, Jr., Chairman, Georgia Agricultural Commodity Commission for Peanuts, Tifton, Georgia; Mr. Cecil M. Bynum, Chairman of the Board, Southwestern Peanut Growers Association, Gorman, Texas; Mr. Sydney C. Reagan, General Counsel, Southwestern Peanut Shellers Association, Dallas, Texas; and Dr. Charles J. Kensler, Consultant, National Peanut Council, Washington, D.C.

The Committee expresses its appreciation to the Department for permitting industry representatives to appear at the public session and to present their views on the research needs in the oilseed, peanut and sugar industries. It also commends the Department scientists and administrators for the effective presentation of their research programs.

Dr. Nyle C. Brady, Director of Science and Education, Office of the Secretary, USDA, is Chairman of the Committee; Dr. W. D. Maclay, Assistant Administrator, Nutrition, Consumer and Industrial Use Research, Agricultural Research Service, USDA, is Vice-Chairman; and James F. Lankford, Research Program Development and Evaluation Staff, is Executive Secretary.

After a careful review of all the material available, the Committee submitted the following recommendations to the Secretary of Agriculture.

Additional copies of this report may be obtained from James F. Lankford, Executive Secretary of the Oilseed, Peanut and Sugar Crops Research Advisory Committee, Research Program Development and Evaluation Staff, U. S. Department of Agriculture, Washington, D. C.

REPORT AND RECOMMENDATIONS

GENERAL COMMENTS

The Committee commends the Department and the Congress for increasing the 1965 Budget so as to provide more professional man-years for farm research in the important food areas of oilseed, peanut, and sugar crops. The Committee appreciates the problems in obtaining funds and the need for overall budgetary reductions and is pleased that appropriations for basic farm research not only have not been generally adversely affected but have been increased in important priority areas.

The Committee reiterates its 1963-64 recommendations concerning the acute need of creating a more favorable public image of the national importance of agricultural research. The Committee feels that this cannot be achieved until the prestige of agricultural research in relation to other research activities of the Federal Government is elevated by moving the Director of Science and Education to the level of an Assistant Secretary of Agriculture. Such a change in placing agricultural research in its deserved relationship to other departments of the Government would have the important effect of attracting and holding outstanding scientists who are so vital in the solution of agricultural problems.

The Committee commends the Department for its forward-looking planning to increase the support for its scientists. This should have a stimulating effect upon the effectiveness of the research program. The Committee recommends that the present administrative barriers to promotional and recruitment opportunities at the higher leadership levels be so changed as to provide maximum flexibility in the procurement and promotion of top-rate scientists. Such a change will also stimulate the productivity of the Department's scientists.

The Committee was impressed by the steps that have been taken in certain segments of the research program to coordinate the activities of the Department with those of the Land-Grant Colleges and of industry. However, it feels that only a beginning has been made to realize the full potentials of such coordination. The Committee recommends that yearly conferences or seminars between the working scientists of the Department, colleges, and industry be held on similar problems in order to engender thought-provoking discussions and expedite coordination.

The Committee recommends that urgent high priority be given to research on mold mycotoxins affecting peanuts and certain other commodities and the impact of cyclamates on the future of sugar crops. Molds have been with the world since the beginning of time. Now it has been shown that certain mycotoxins are produced by some of these molds on peanuts which makes the problem critical. The Committee commends the Department for initiating expanded research on these mycotoxins. However, it does not consider this program adequate in the light of the potential dangers not only to the peanut industry but also to other crops on which the mold is found.

The use of cyclamates as a sweetener substitute for sugar threatens to replace an alarmingly sizable portion of the sugar market. The Committee recommends that immediate action be taken to initiate a marketing research project on the impact of synthetic sweeteners on the domestic sugar industry. If the Economic Research Service does not have the staff to handle this assignment rapidly and efficiently, it is recommended that the research be contracted with a competent institution.

Since agricultural research is dynamic and must never be allowed to become static, the Committee recommends that the Department formulate plans now for increased research in the future. Such research should include continued collaborative work between the Department of Agriculture, the Food and Drug Administration, other governmental agencies, the Land-Grant Colleges, and industry. It is not too early to plan the necessary appropriation requests to accompany such a program.

The Committee listened with some sympathy during the public session to industry pleas for the restoration of cuts in the research program on the processing of sugar crops as well as on tung oil problems. The Committee is fully aware of the budgetary problems faced by the Department. It recommends that another hard look be taken at these areas before final action on the deletion of this research be consummated to make sure no facets of the program warrant continuing. The Department and others must be certain that they are not practicing false economy by prematurely terminating any facet of these research programs in which there has been a considerable previous investment and which shows promise of providing valuable data in the immediate future.

The Committee notes that plans are to discontinue all tung research at the end of the current fiscal year. It is hoped that a careful re-appraisal be made of this decision to be sure that severe long-time losses are not incurred because of this move. In some areas of research, particularly breeding for improved varieties, a sudden cessation of all work could result in major losses.

The suggestion is made that funds for the continuance of such research can be obtained from a discontinuance of projects involving new crops that compete with existing crops.

The Committee wishes to issue a warning of the perils to the National welfare involved in the curtailment of research in agriculture. Not only do reduced research appropriations limit present basic research that serves as a foundation for the applied research of the future, but such reductions also have a most serious psychological effect upon the ability of the Department to compete with other segments of the American scene for competent scientists to carry on the approved research. We must never lose sight of the fact that research has brought America to its present world leadership in agriculture.

FARM RESEARCH

A. Culture, Breeding, Diseases, and Variety Evaluation

Soybeans: While soybeans have been produced in the United States for over 40 years, the national yields have never exceeded 25 bushels per acre. In fact, during the past decade yields have only increased 18% compared to corn increases of 58%, cotton 60%, and grain sorghum 119%. Yet the demand for soybeans has been increasing at a rapid rate, and it is expected to increase another 50% during the next five years. To meet increased production requirements, growers have been expanding their soybean acreage. However, there is a limit in additional land that can be used for producing soybeans and unless there is some breakthrough in the existing yield barrier, it is doubtful if the anticipated increased domestic and foreign demand for soybeans and soybean products can be met. The yield barrier is also hampering farmers' efforts to cut production costs.

This Committee recommends that fundamental basic research on the physiology and nutrition of the soybean plant be expanded. Particular attention should be given to providing answers to the following: Why does a soybean plant fail to respond to additional fertilizer applications; how does the soybean plant convert energy to oil and protein; why are yields reduced when soybeans are grown on land more than one year; what is the relationship of the nitrogen fixation bacteria to yields of soybean; what are the relationships of the various strains of bacteria to the different varieties of soybeans; and how do the bacteria react to the temperature, fertilizer, soil and water conditions on the host plant?

This Committee also recommends continued emphasis be placed on soybean varietal breeding work. Control of phytophthora root rot, soybean cyst nematode and a host of other diseases and plant pests depends upon the development of new varieties or strains which will be resistant or tolerant to these yield factors. Varieties are badly needed that have better seed viability with less soil moisture.

With the advances in utilization technology and increased competition among vegetable oils, new soybean varieties with special quality attributes will be needed. For example, if the production of isolated protein continues to expand at the present rate, varieties with higher protein solubility will be in demand. Similarly, if and when the importance of unsaturated fats in human diets is clearly demonstrated, it may become necessary to change the fatty acid composition of soybean oil in order to maintain its current markets. Genetic research should be undertaken by the Department to determine the extent of genetic variability of important quality factors and ascertain the best procedures for developing varieties with these characteristics.

Soybean physiology - Research on enzyme systems and internal processes in the plant that govern gross differences in the distribution of energy accumulated and the uptake and utilization of nutrients is needed. In comparison to many other crops, the soybean plant must accumulate and store an unusually large amount of energy per unit weight of seed produced. In addition, energy to convert the simple products of photosynthesis into the more complex

storage products and energy to support the nodulation process are required. Soybean types essentially identical in basic genetic background that differ greatly in number, size, shape, and orientation of leaves have been developed and should be used in research on the extent to which light interception is a basic limitation to soybean yields. Other types that differ greatly in the extent to which accumulated energy is distributed between the oil and protein fractions of the seed, types that differ greatly in the amount of phosphorus, zinc, chloride, manganese, and iron which they can or do accumulate and utilize are also available.

Soybean nodulation - Research should be expanded to develop methods of identifying superior strains of nodulating bacteria and introducing them into commercial fields to increase efficiency of nitrogen fixation. Results of recent research clearly indicate the possibility of developing inoculation techniques to permit the introduction of a selected strain of bacteria that would largely replace the bacteria in the soil in the formation of nodules on the plants. Other research has demonstrated extreme differences in effectiveness of strains of nodulating bacteria on different varieties of soybeans. These results suggest the distinct possibility of increasing effectiveness of nitrogen fixation on a commercial scale.

Biological and chemical control of diseases - Research on the influence of the microflora of the soil on the development of soil-borne diseases and on means of inducing changes in the soil to reduce damage by diseases should be initiated. Some of the most important diseases of soybeans are soil-borne and breeding for resistance to some of them (notably stem canker, brown stem rot, and the soybean cyst nematode) has been slow and difficult. No source of complete resistance to stem canker or brown stem rot is known. Brown stem rot was reported for the first time in North Carolina and Virginia in 1962 and the incidence and severity of the disease in the major soybean-producing areas were unusually high in 1963. Results of recent research suggest that one or more species of pathogenic bacteria are always present in soybean plants and no soybean seed free of the bacteria have been found to date. Research on systemic chemicals to control seed-transmitted bacteria, viruses, and other plant pathogens is needed.

Peanuts: The Committee is encouraged by the implementation of some of the recommendations relating to peanut research that were made by us in 1964. This statement is made after reviewing the research information furnished to the Committee by the USDA and statements presented to the Committee by representatives of the peanut industry.

The Committee feels that the additional scientists to work on breeding, diseases, and culture of peanuts is a step in the right direction. The peanut disease research that has been initiated with special emphasis on studies of microfloral succession of molds on and in peanut pods and seed on the farm in all three major producing areas should be continued and expanded.

In order to improve peanut quality, reduce cost of production, and increase consumer acceptance, it is recommended that major research efforts be made in the breeding program to obtain a variety, or varieties, with the genetic characteristics essential for mechanical harvest. It is also desired to

have a Spanish type in the Southwest with a lower linoleic acid content. Such a peanut would provide more flavor-stability for the end user. The genetic characteristics should tolerate diseases, including nematodes, and be adaptable to pesticides, herbicides, fertilization, fungicides, irrigation, residues and artificial curing. Special emphasis should be applied to molds as related to their development and control during growing, harvesting, and curing periods.

The environmental factors affecting the physiology of the peanut plant need to be evaluated for the different ecological conditions found in the three peanut-producing areas. This is very important as to the effect of soil, air temperature, light, soil moisture, atmospheric humidity, and mineral nutrition on growth and development of the fruit of the plant. The desired result of this study should be to lead to complete and equally matured peanuts.

The Committee recommends that the USDA give special attention to the acute problems existing or occurring within each of the three peanut-producing areas in the United States pertaining to research, and conduct the research within the area where the problem exists or arises.

The Committee appreciates and commends the USDA for the steps taken to coordinate all areas of peanut research. However, to further implement research, we recommend the creation of a committee composed of USDA's and State Experiment Stations' research and administrative personnel to deal with the overall peanut research program of the USDA and the States at all levels.

Flax: One of the most serious problems confronting the flax producer is the relatively low yield per acre compared to the other crops competing for acreage in the flax-growing areas. Over the past decade average yields have increased only 4%.

Work should be continued in the field of fertilization.

The rust problem is still a serious threat to the entire flax crop. The survival of the crop may well depend on the success of the program to discover and use new rust-resistant genes.

A better and more effective pre-emergence weed spray is needed, especially a grass weed spray which will remain and be effective in soil for at least 12 to 16 weeks. Present pre-emergence sprays are effective for about 30 days.

Sugarcane: The Committee cannot emphasize too strongly the importance of farm research on sugarcane for this may well be the key to survival of a large segment of our cane industry. Recent alarming downward trends in sugar consumption portending future cutbacks in production coupled with the ever-tightening squeeze between a relatively low price level for sugar and steadily increasing costs, make it imperative that farm research come to the aid of the sugar producer by developing means of lowering costs and increasing returns.

As breeding and varietal improvement continues to be the most important approach to increased yields per acre, improved factory yield per unit processed, cost reduction due to varieties better adapted to complete mechanization, and disease and insect control through breeding for greater variety resistance, the Committee recommends that the present breeding program be continued and enlarged wherever possible.

The Committee wishes to commend the Department of Agriculture on the expanded breeding program at Canal Point, Florida, and in Puerto Rico. The addition of more scientists in these areas has greatly enhanced the breeding program. The addition of more physical equipment at Canal Point is also recognized by the Committee.

In connection with the breeding and variety program, nutritional requirements of the various varieties should be studied.

In some domestic areas, yields per acre have stabilized. This Committee recommends that a team (including an entomologist) be formed for the collection of new germ plasma.

There is an extremely pressing need for immediate research on the mycorrhizal relationships of the root system in the various soils of the cane areas which may be of great importance in sugarcane culture. The necessity of engaging the services of trained microbiologists to study fundamental soil microbiological and mycorrhizal relationship in sugarcane is urgent.

The Committee commends the work now initiated on varietal decline. This work should be continued and emphasized in the future.

Disease problems continue to retard maximum sugar production in all areas. Although past breeding programs have helped to reduce losses from this source, new viruses and other pathogens have appeared and are already causing considerable losses.

Continued basic research must be done to evaluate these new diseases and ways and means of controlling them. This research should involve the study of the use of fungicides, crop rotation, and the role played by weeds, insect pests, and rodent animals in acting as vectors of virus diseases.

Sugar Beets: Sugar beets with acreage restrictions and ever-increasing farm costs more than ever need emphasis on continuing research necessary to improve production per acre. Regardless of sugar surpluses or shortages, unit production per acre of sugar crops must be economically competitive with other commodities assuring a reasonable return to producers if we are to maintain a reliable domestic source of sugar.

Sugar companies and State Experiment Stations will continue the necessary applied research on problems of most immediate concern to growers and processors. It is again recommended by the Committee that the Department of Agriculture join with the industry, particularly in the area of basic research, to help growers and processors.

The need for chemical and mechanical substitution of labor is of the utmost importance in light of recent developments. Breeding for varietal improvement continues to be of great importance in the production of sugar. Some of the aspects of variety improvement that need additional basic research are: (1) male sterility, a genetic mechanism which permits the production of hybrid varieties; (2) polyploid, a breeding technique from Europe that has the possibility for both yield improvement and disease resistance; (3) interspecific crosses to utilize sources of resistance to insects, diseases, nematodes, and soil organisms; (4) factors influencing bolting, a reproductive process necessary for seed production; (5) factors influencing seed germination; (6) physiology of the sugar beet and its association with the multitude of factors affecting quality; and (7) biochemical studies associated with disease resistance.

Diseases continue to be a major hazard in all areas of domestic sugar production. Basic studies on disease causes, transmission of viruses and identification of new strains of viruses should be intensified. This fact is exemplified by the fact that even though in recent years the level of varietal resistance to curly top has been adequate, new strains of this virus have been identified which are apparently more virulent. Consequently, more resistant breeding lines of sugar beets need to be found.

Virus yellows is of great economic importance in California and the disease is also evident in the Pacific Northwest and the Intermountain region. The vector of this virus, the green peach aphid, is found in most areas where sugar beets are grown. Beets infected with virus yellows may also be attacked by the curly top virus and vice versa. The damage from the two viruses is additive. The geographical areas affected by these virus diseases and the presence of the insect vector in other areas points up the need of an expanded basic research program.

Present levels of varietal resistance to aecospora leafspot and black root diseases need to be raised. These are the primary diseases in large areas of present sugar beet production and would also be a problem in some of the new areas interested in sugar beets.

The work on Rhizoctonia root rot should be continued.

B. Insects

Soybeans: Effect of stink-bug feeding on soybean quality continues to be a problem and emphasizes the need for expanding research to develop varieties of soybeans that are resistant to this and other insects. Many effective insecticide materials cannot be recommended to control soybean insects because of excessive residues. Consequently, increased emphasis is needed to develop safe, effective chemical control methods, and to investigate biological and cultural methods. It is recommended that a portion of the new funds provided for pesticide research activities by the 88th Congress be used to explore this area of research.

Sugarcane: Development of resistance to present insecticides, the residue problem, and the effect of insecticides on beneficial insects and fish and wildlife should be studied. Major efforts should be made to develop insecticides that overcome these objections to their use.

Research in biological control should be intensified as well as on attractants, repellants, and sterilization approaches for the control of insects.

Serious studies should be made to improve our plant quarantine facilities to prevent the introduction of new insect pests.

In another closely related problem, a cooperative program should be initiated with the Fish and Wildlife Service to make a thorough study on means of economic control of rodent animals which cause serious aggregate losses in some cane areas.

C. Weed Control

Oilseed Crops: Yield and quality losses due to weeds in soybeans amount to more than \$250 million each year. In addition, farmers spend over \$100 million each year to control weeds in the crop. There are no satisfactory chemicals for controlling weeds in soybeans. Expanded basic and applied research to develop efficient and economical chemical, cultural, mechanical and combination weed control practices in soybeans, peanuts, flax, sesame, and other oil crops is critically needed to permit increased mechanized production, reduce annual weed losses, and increase yields and quality of these crops. New research is urgently needed to develop more efficient chemical weed control methods, including the rotational use of herbicides and mixtures of herbicides alone and in combination with cultural, crop competition, crop rotation, and biological methods, and to determine the accumulation, metabolism, and ultimate fate of herbicides in oilseed crops and associated soils.

Sugar Crops: Recent events that are affecting farm labor supplies further point the need for a crash program to control weeds in sugar crops. Improved chemical, cultural, mechanical, and combination practices of weed control in sugar crops are absolutely necessary with the impending loss of cultivation labor to reduce annual weed losses, permit an increase in mechanized production, increase crop yields, and improve quality of sugar crops. Expanded research on the agronomic, physiological, and biochemical aspects of weed control in these crops are needed to gain a better understanding of the variations in weed control efficiency obtained by different herbicides as influenced by soils, climatic conditions, other environmental factors, and crop development. Research is also badly needed on the metabolism and fate of herbicides in sugar crops, the residual action of herbicides in soils, the effects of herbicide applications on subsequent crops in the rotation, and the integration of newly developed chemical weed control practices with present cultural practices. It is more important that increased emphasis be placed on developing new and more effective pre-emergence herbicides, particularly on control of grasses.

D. Nematode Control

Peanuts: Root-knot nematodes, string nematodes and root-lesion nematodes are known to affect peanut yield and quality, but they almost never are found alone in peanut roots, stems or pods. Fungi are present also. Basic research is needed to clarify the relationships of nematodes to these organisms with the object of developing methods for preventing

rots and consequent loss of yield and quality. The Committee is concerned over the fact that USDA has placed only 0.8 professional man-year on weed control in peanuts in light of the fact it was rated as the number one problem in 1963 and given high priority in 1964.

Soybeans: Soybeans in all parts of the country are attacked and injured by root-knot nematodes, root-lesion nematodes, stylet nematodes, spiral nematodes, and others in addition to the well-publicized soybean-cyst nematode. Of these, only the root-knot nematodes have been studied in a preliminary way, mostly in the southern States. Research is needed to clarify the relationships of these nematodes to nitrogen nodulation and to root-rotting fungi attacking soybeans. This program should be slanted toward accumulating the information needed as a basis for a sound program of nematode control including the incorporation of nematode resistance into soybean varieties.

Sugar Crops: Nematodes damage the roots of sugar plants, but nematode damage to sugar plants is almost invariably associated with damage due to fungi. Basic research on the complex relationships of the sugar plants, the nematodes, and the fungi is needed to provide new approaches to control and more efficient crop production.

E. Agricultural Engineering

Soybeans: Glow-discharge radiation of soybeans and soybean meal has demonstrated certain properties such as early germination, and more rapid oxidation of peroxide value of ether-soluble fractions. Research should be expanded to determine the value of the treatment.

Peanuts: The Committee strongly recommends the implementation of its 1963-64 recommendations relating to agricultural engineering in peanuts. It repeats herewith with renewed vigor that the study of the causes and means for the prevention of mold development during peanut harvesting, curing, storage, and milling should be intensified.

The Committee is alarmed that USDA has only one man in Agricultural Engineering Research directed toward this problem. Additional manpower is urgently needed.

Sugarcane: This Committee wishes to recognize the progress made in the recumbent cane harvester project. Reports of the cooperation between the research group and the Industry Harvester Committee are very gratifying. The sharp increase in the activity of the cane harvester development program is highly significant.

The need for a cane harvester to harvest recumbent cane is still a serious problem in many domestic cane areas. The need for this type of harvester due to labor shortage and high harvesting costs cannot be overemphasized.

The report on the results of the use of PL 480 funds for harvester development in foreign areas are not too encouraging; however, the Committee proposes that this work continue, but with adequate supervision from USDA engineers connected with the harvester development program.

Closely related to the harvester program is the development of desiccants to minimize the amount of trash and tops so that mechanically harvested cane can be processed without the introduction of serious problems into the factory.

All domestic areas are in need of an efficient desiccant, basic research in the development of such products should be greatly intensified.

NUTRITION, CONSUMER AND INDUSTRIAL USE RESEARCH

The Committee commends the Department for its research in the field of utilization. The program now established on the various commodities reviewed by this Committee should be continued. Programs should be directed toward basic research, and adding to the knowledge of fundamental chemical and physical properties of the commodities. Research on chemical reactions, composition, and improved analytical methods should be continued.

Research should be initiated or continued in the following areas:

Linseed Oil: (1) Basic studies on linseed oil in water systems, both solution and emulsions. Such basic research should be expanded and intensified in order to provide a more rapid solution of problems in this area. Continued research is needed on pigment interactions, an improvement in application properties, and on water-thinned linseed oil paints.

(2) Linseed oil coatings for concrete. Increased emphasis should be placed on basic studies on the use of linseed oil as a joint curing and anti-sealing agent for concrete. Superior methods of curing concrete with linseed oil compositions are needed to permit the proper curing of concrete under adverse conditions and still impart to the concrete antisealing properties.

(3) Expanded basic and exploratory research on the chemical modification to find new derivatives or better methods of making potentially useful products, such as conjugated oils, metallic complexes, new coating systems.

(4) Color retention and durability of linseed oil protective coatings. A program of basic studies should be initiated to obtain more information on the autoxidation of linseed oil and chemical modifications thereof, on the mechanism of formation of polymers and their subsequent crosslinking to solid films during oxidative drying and on the chemical and physical factors involved in deterioration and color change in plain and pigmented films. Effect of pigments and driers on tint retention, durability, and other properties need study.

Soybeans, Oil and Meal: Basic research on the chemical composition and physical properties of oil, protein, and other constituents has been more useful than narrow applied programs and should be continued. Studies on oil flavor stability and long range work on chemical modification of soybean oil for industrial applications are desirable. An understanding of flatulence factors, the effects of heat and moisture on soy protein and the components of soybean flavor should be furthered through continued research. Studies on biological contamination

of soybeans and soy products should continue to be closely coordinated with other commodity research programs and further study on soy protein application to foreign diets be continued and expanded.

Peanuts, Oil and Meal: The Committee recommendations of last year are re-emphasized again. The need for realistic supervision in obtaining knowledge of fundamental chemical and physical reactions of peanuts and their products in processing is also applicable, and research should be directed to the basic unsolved problems rather than refinements. It should be stressed that the mycotoxin problem in all basic research areas should receive the coordinated priority effort and supervision in all the various groups working in this area together with the cooperative industry endeavors. A chemical wash to inactivate toxicity in peanuts is urgently needed.

The Committee would like to point out that while the manpower commitment to oilseed and peanuts and human nutrition and consumer use research is quite limited, this effort has been most productive in terms of the development of materials useful to industry.

Tung: Research should continue on the application of this material as an agent in fire retardant coatings and because of its unique chemical nature chemical modification, and industrial application studies must seriously be considered for continuance.

Sugar Cane: The Committee views with alarm the complete curtailment of all utilization research on sugar cane. While it is recognized that economy measures may be necessary requiring cutbacks in low priority research programs, it feels that the basic research being done on the components of sugar juices with the ultimate aim of improving the recovery of sucrose from these juices is of increasing importance. The changeover to mechanical harvesting already accomplished in some cane areas and facing the other areas in the near future will increase the impurities in the sugar juices making this basic research program even more important. Inasmuch as the industry is already making substantial contributions to this work, this Committee feels that the Department should explore the possibility with industry groups of shifting more of the cost to industry, thus decreasing the amount of Federal funds devoted to the work without cutting off all funds and causing its complete abandonment.

Sugar Beets: Funds should be made available for continuation of the utilization work on sugar beets. Basic knowledge on the composition of the crop and the chemical changes that take place in processing is needed. Storage of beets awaiting processing undergo biochemical changes that adversely affect the extraction of sugar, and these changes are not understood.

There is a need for research in the field of by-product utilization and also a need to develop uses of sugar for purposes other than human consumption. The development of synthetic sweeteners as a substitute for sucrose sweetness can make development of industrial or other uses of sugar imperative.

Substantial progress has been made by the Department on several projects that show definite promise. These new approaches to processing may lead to

substantial improvements and savings in the processing of sugar beets. Projects like these should be completed.

In light of the industry's interest in continuation of utilization work in beet processing, the Department should explore with industry groups a cooperative program in which industry would share in the costs of various programs.

Castor and Other Western Oilseeds: Basic chemical constituent, modification, and industrial usage studies on castor oil should be continued. Safflower oil and protein research programs including work on oil flavor and stability problems and increasing the feeding value of meals are important and should be encouraged.

Replacement Crops: Screening and characterization of potential replacement crops continues to have importance in agriculture and should be kept active provided they do not compete with existing crops. Basic chemical studies and industrial usage programs on erucic oils and acid have shown progress and should be maintained. Basic protein studies of these crops also require continued investigation.

Nutrition: Fundamental studies on nutrition should continue and the work on the effect of pesticides on nutrition should be intensified.

MARKETING AND ECONOMIC RESEARCH

Objective Measurement of Market Quality

Soybeans: Continued emphasis should be given to research to develop a simple, practical mechanical method for making a rapid clear-cut separation of pieces of soybeans from true foreign material.

Research should be continued on the chemical, physiological, and bio-chemical changes which occur in the post-harvest period including the examination of strange molds, particularly those that produce metabolites toxic to animals.

Peanuts: Improved methods and equipment to more objectively evaluate quality in peanuts are needed. The research initiated to study the development of mycotoxins during the marketing of peanuts is a step in the right direction. This research should be expanded to provide simple, rapid, and inexpensive methods for sampling and quality evaluation of small lots of peanuts throughout the marketing process.

Flaxseed: Present methods of determining dockage in flaxseed are expensive and slow. Studies should be initiated that will lead to developing a rapid mechanical method to determine total dockage.

Protection of Peanuts Against Insect Damage

The standard malathion treatment for insect control in peanuts is not likely to continue to be effective for any extended period of time. There is more and more evidence that the major insect pests of peanuts are

developing strong resistance to malathion. Thus increased efforts should be devoted to the search for more effective protectants and to studies of other methods for effective protection of peanuts.

Effects of Field Damage on Market Quality of Soybeans

Stinkbug damage in soybeans has gradually become an important problem as the crop has expanded in southern areas. Stinkbug damage and other field damage seriously reduce the grade and market price of soybeans. Studies are needed on the effects of stinkbug and other field damage on the true market value of soybeans so as to more accurately assess damage.

Economics of New Crops

Continued emphasis should be placed on an economic evaluation of new crops. These studies should precede large-scale agronomic and chemical appraisals so as to pinpoint those crops offering most promise and reduce research costs in non-profitable areas. Such economic studies should include careful appraisal of the competitive role of the potential new crops to crops in commercial production.

Economics of Sugar Markets in Relation to the Growth of Synthetic Sweeteners

The mushrooming growth of synthetic sweeteners is of serious concern to sugar producers and processors. The industry needs to know the prospective long-time impact of this new development. This matter is of sufficient importance to the industry to be placed in a position of top priority, including deferring other economic research in the area of sugar crops until a careful study is made of this entire area.

National and International Aspects of Soybean Marketing

The rapid expansion in soybean sales at home and abroad has caused concern as to the long-time future of the industry. Facts are needed as to the developments abroad in competing products such as fish oil and meal and oil palm products, potential increases in demand, price levels necessary to move larger volumes of soybean products, and the like. An overall economic study of the long-time demand and supply situation for soybeans and competing products is essential to sound planning by the industry.

Peanut Marketing

There is a need to evaluate the present and possible alternative methods of marketing farmers' stock peanuts in all peanut-producing areas. Marketing efficiency is essential if the industry is to be maintained and such efficiency must accompany new developments in production and processing.

Sugar Marketing Margins

Current developments in sugar marketing including higher charges for many items particularly stevedoring charges make it desirable that a thorough study of overall costs of moving sugar to market be made.

Industrial Uses for Agricultural Products

The Committee reaffirms its position of 1964 on the importance of continued research on market potentials for agricultural products and their derivatives in industrial, non-food uses.

Demand Base for Soybean Meal in Mixed Feed Rations

The Committee reaffirms its position of 1964 that research should be conducted to determine the broad demand base for soybean meal in mixed feed rations.

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UNITED STATES DEPARTMENT OF AGRICULTURE
Research Program Development and Evaluation Staff
Washington, D. C. 20250

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REPORT AND RECOMMENDATIONS

20
of the ~~THIRD~~ MEETING, of the
OILSEED, PEANUT AND SUGAR CROPS RESEARCH ADVISORY COMMITTEE,
Washington, D. C. January 24-27, 1966

MEMBERSHIP OF THE COMMITTEE

Mr. Sherwood R. Baxley, Vice President - Peanut Purchasing and Shelling,
Tom Huston Peanut Company, Columbus, Georgia

Mr. Franklin A. Beale, Executive Vice President,
Central Aguirre Sugar Company, Aguirre, Puerto Rico

Mr. Chester B. Biddle, Farmer, Remington, Indiana

Mr. John B. Boy, Executive Vice President,
United States Sugar Corporation, Clewiston, Florida

Mr. Jacob Hartz, Jr., Manager, Jacob Hartz Seed Co., Inc.,
Stuttgart, Arkansas

Mr. Ray J. Lindquist, Jr., President, Minnesota Linseed Oil Co.,
Minneapolis, Minnesota

Mr. Gordon H. Miller, Farmer, Grandview, Washington

Dr. John F. Murphy, Director of Research and Development,
Swift and Company, Chicago, Illinois

Mr. Owen S. Rice, President, California Beet Growers Assn., Ltd.,
Santa Maria, California

Mr. Guy O. Rorabaugh, Vice President - Operations,
Holly Sugar Corporation, Colorado Springs, Colorado

Mr. C. L. Stenhjem, Farmer, Kindred, North Dakota

Mr. Hassell Thigpen, Farmer, Tarboro, North Carolina

Mr. Elvin A. Walker, Farmer, De Leon, Texas

Mr. Aaron S. Yohalem, Senior Vice President,
Corn Products Company, New York

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MAY 4, 1966

CURRENT SERIAL RECORDS

PREFACE

The third meeting of the Oilseed, Peanut, and Sugar Crops Research Advisory Committee was held in Washington, D. C., January 24-27, 1966. Dr. George L. Mehren, Assistant Secretary of Agriculture, is chairman of the committee, and Dr. Sam R. Hoover, Assistant Deputy Administrator, Agricultural Research Service, is vice chairman. All committee members were present. Mr. Joseph R. Smith, Vice President, Pacific Vegetable Oil Corporation, San Francisco, California, and a member of the National Agricultural Research Advisory Committee, attended as liaison representative between the two committees.

During the public session on January 24, representatives of the following organizations presented statements pertaining to research needs:

The Southeastern Peanut Assn.	- John W. Greene, Executive Director
North Carolina Peanut Growers Assn.	- Joe S. Sugg, Executive Secretary
National Flaxseed Processors Assn.	- C. E. Morris, Director of Research and Development
National Soybean Processors Assn.	- Karl Mattil, Soybean Research Council
National Soybean Crop Improvement Council	- Robert W. Judd, Managing Director
Southwestern Peanut Shellers Assn.	- Sydney C. Reagan, General Counsel
Association of Sugar Producers of Puerto Rico	- Dudley Smith, Vice President
Beet Sugar Development Foundation	- James H. Fischer, Secretary Manager
American Tung Oil Association	- Roland R. Becke, Executive Secretary

As a basis for its recommendations the Committee reviewed research progress reports which were supplemented by oral reports, visual materials, and discussions by leaders of research programs. Following these reviews and discussions the Committee divided into subcommittees. All subcommittee recommendations were reviewed by the entire committee before they were approved for inclusion in the final report to be submitted to the Secretary of Agriculture.

Additional copies of this report may be obtained from Max Hinds, executive secretary of the Oilseed, Peanut and Sugar Crops Research Advisory Committee, Research Program Development and Evaluation Staff, U. S. Department of Agriculture, Washington, D. C. 20250

OILSEED, PEANUT AND SUGAR CROPS RESEARCH ADVISORY COMMITTEE
REPORT AND RECOMMENDATIONS

GENERAL COMMENTS AND RECOMMENDATIONS

Planning-Programming-Budgeting

The Committee commends the Department for the energy and cooperation that has been displayed in instituting an effective program of planning-programming-budgeting. Especially commendable is the long range study of agricultural research now underway by the effective team of the U. S. Department of Agriculture and the State Agricultural Experiment Stations.

Personnel Policies

The Committee, in noting problems in programming brought about by a lack of manpower and the difficulty of recruitment, recommends that the present administrative barriers to promotional and recruitment operations at the higher leadership levels be amended as to provide maximum efficiency in the procurement, retention, and promotion of scientists. Promotions should be made in accordance with ability and responsibilities without regard to numbers within a particular grade.

World Food Supply

The continued economic growth of our Nation is a testimonial to the contribution of research. A critical area in which our farm economy currently finds itself and the tremendous demands to be placed on research by the War on Hunger is epitomized by such commissions as the National Food and Fiber and the National Food Marketing Commissions. The Committee recommends that high priority be given to expanded research on oilseed commodities to supply the free world with acceptable highly nutritious protein-rich foods. Inexpensive and attractive protein concentrates and food products from vegetable sources can fulfill a definite need in many areas, particularly the developing nations. The development and utilization of protein-rich materials depends on the creation of acceptable products and techniques of incorporating these products into foods.

Public Image of Agricultural Research

The Committee reiterates its prior recommendations concerning the acute need of continuing and intensifying the research activities of agriculture and creating a more favorable public image of the national importance of agricultural research. In this same area the Committee again recommends that the Director of Science and Education be raised to the level of an Assistant Secretary of Agriculture.

Residual Tolerance for Pesticides

This Committee wants to join with the many other segments of industry and government in requesting expanded research efforts that will provide an early determination of the allowable residual tolerances for all insecticidal and pesticidal materials. This decision is important to the protection of the Nation's supply of food and fiber as well as being a necessary safeguard to human health and the preservation of viable environment for plant and animal life.

Toxic Molds

As far back as the Middle Ages, it was recognized that some molds could produce toxic products. This problem is now receiving renewed attention in the Department of Agriculture and the State Experiment Stations. An integrated program involving research, regulatory, and educational aspects of the subject has been organized by the Department. The research effort in a very short time has uncovered much factual information to provide the basis for full control of the problem. This effort should be maintained and expanded both at the national and state level.

Research Contributions through Public Law 480

The Department is to be commended for its effective use of counterpart funds to expand basic research on agricultural problems. By this means, the effort of outstanding scientists in many countries has been enlisted in agricultural research of mutual benefit and need. Potential hazards to American agriculture have been studied at their source. A wealth of new compositional information on agricultural commodities has been obtained. The P.L. 480 research program holds great promise for making important contributions to world food programs designed to alleviate the protein and calorie deficiencies of the developing countries.

National Peanut Marketing Research Laboratory

The Committee strongly recommends that every effort be made to keep construction schedules for the National Peanut Marketing Research Laboratory at Dawson, Georgia, progressing so as to meet the scheduled opening date in the fall of 1967 and that adequate funds be provided to properly equip and staff the laboratory when completed. We realize that personnel and much equipment now being used in temporary facilities at Dawson and Albany, Georgia, will be incorporated into the new laboratory when it is completed. In the meantime, it is recommended that the engineering and quality research on the drying, shelling, and storage of peanuts now being conducted in temporary facilities be continued and increased to the extent possible.

Facility for Sugarcane Research

The Committee wishes again to recognize the need for better physical facilities at the Canal Point, Florida, station. The 47-year-old laboratory-office buildings were built originally for one scientist. The facilities have been enlarged by converting a dwelling and adding a greenhouse which was partly financed by contributions from the Florida Sugar Cane League but they are inadequate for the accelerated research program.

Rodent Control - Fish and Wildlife Service

The Committee was informed that research and control programs on predatory rodents were carried out in the Bureau of Biological Survey in USDA from 1910 to 1940. By Executive Order this activity was transferred to the Fish and Wildlife Service of the Department of Interior in 1940. Because rodent damage to sugarcane is now a serious economic factor in sugarcane production in all domestic areas, it is requested that the Department of Agriculture make such arrangements with the Fish and Wildlife Service as necessary to develop needed research and control programs.

Allocation of Chemicals for Weed Control

Farm chemicals for weed control play a very important part in maintaining yields of important crops. Under conditions of increased world tension food of all kinds, as well as oil seeds, would be in great demand. In the event of a national emergency and a resulting necessity to allocate chemicals, it is recommended that to the extent possible a sufficient supply be made available for farm weed control.

FARM RESEARCH

In areas of farm research, the Committee recommends that wherever possible and advisable research be conducted in the area where the particular problem is most critical.

A. Culture, Breeding, Diseases, and Variety Evaluation

Soybeans: The Committee recommends the continuation and intensification of research to solve problems that affect soybean production or limit industrial use of the crop. There is a continuing need for higher yields of better quality soybeans to satisfy the world demand for low-cost high-quality protein and oil to help solve nutritional problems existing in many areas of the world.

Inadequate yields per acre. Additional effort is needed to identify specific biological or environmental factors limiting yield:

Present limited work on soybean-bacteria relationships affecting nitrogen fixation efficiency should be continued and expanded. Metabolism and nutrition of normal and non-nodulating varieties should be studied in more detail. Techniques are needed to establish a new strain of bacteria in fields where soybeans have been grown.

More detailed study of germ plasm is needed to identify desirable traits for use in breeding such as disease resistance, improved nutrient response, and male sterility. Research is needed now to discover or develop these and other genetic traits and to find means of incorporating them into good agronomic types. Progress in variety development depends on the amount of material evaluated. Regional variety evaluation should be increased with special attention to development of varieties specifically tailored to local conditions.

Ecological, cultural, and management factors that limit yields are not well understood. Studies are needed by field agronomists and physiologists specifically directed toward combining all factors for maximum yield level in each major area of production. Research of this type is especially suitable for contract arrangements.

Improvement of chemical composition. Research should be intensified to develop varieties combining high yield, high oil, and high protein with good agronomic qualities. Since in a sense these objectives are mutually exclusive, much more effort is needed to identify and isolate the relatively rare germ plasm in which all desirable traits are combined. Recent research in other crops, e.g., corn, rapeseed, and safflower, has shown the possibility of finding a strikingly different chemical composition within a species. In corn, a mutant with significantly higher lysine has been found. In rapeseed and safflower, major fatty

acids have been virtually eliminated or drastically reduced by introducing new germ plasm. Present screening work to seek a low or zero linolenic acid line in the germ plasm bank or in soybean relatives should be greatly accelerated. Similar screening of the germ plasm for improved amino acid composition should be initiated.

Improved control of soybean diseases. Brown stem rot, stem canker, and the complex of diseases and environmental factors responsible for poor seed quality are not likely to be eliminated by plant breeding. These and other diseases must be conquered with additional pathology research.

In addition to plant breeding and genetic effort listed previously, research is needed to find alternate control measures for the above diseases. All aspects of brown stem rot transmission and infection and the mechanism of pathological action must be identified. Chemical, cultural, or other means of controlling the disease must be found.

Specific and increased attention is needed for the disease complex related to seed quality which is a major problem in the lower Midwest, upper Delta, and middle Atlantic areas. Practical measures for inducing poor seed quality under controlled conditions and for preventing poor seed quality in the field are urgently needed.

The abnormal physiology of diseased plants has had only limited study, yet such research may provide important information for solution of brown stem rot and other diseases.

Peanuts: The Committee commends the Department for the many steps taken to coordinate peanut research.

Research on peanut physiology should be initiated to provide information to increase the efficiency of use of fertilizers and irrigation water and increase the yield of peanuts of higher market quality. Relation of environment as it affects the physiology of the peanut plant in the three major production areas needs study. Information is needed on the response of the peanut plant to soil and air temperature, relative humidity, light, soil, moisture, and mineral nutrition. Also, there is need to develop peanuts with a lower linoleic acid content. The prospect of additional research on mechanical harvesting and curing is encouraging -- a critical need exists for peanuts that are better adapted to mechanical harvesting and curing.

The Committee is pleased with the plan for adding a plant pathologist at Holland, Virginia, to strengthen the work on peanut diseases and the addition of a scientist at Stillwater, Oklahoma, to work toward developing nematode resistant peanut varieties.

Also, the Committee commends the Department for leadership in expanded research on mold mycotoxins and is pleased with the vigor of its present research effort. We urge its continuation on an expanded level, from the soil to the end products. Special study of mechanical harvesting and drying and storage as related to mold is needed.

A potentially totally destructive disease has made its appearance in the Virginia-Carolina area. Stunt virus in 1965 reduced yield in a few fields as much as 90%. A spread of this virus with such severity could jeopardize the entire peanut industry. Research study to develop control of this virus should be given top priority by all means available.

Southern blight, leaf spot and root rot are extremely costly to peanut growers. Research to develop peanuts with genetic characteristics able to tolerate these diseases as well as nematodes is badly needed. Basic studies are needed to classify nematode disease associations, especially peg rots and mycotoxins, and to determine the environmental factors regulating nematode injury. Greater support should be given to basic studies on the nature of resistance to the northern and peanut root knot nematodes and to sting and root lesion nematodes to provide a basis for successful breeding programs.

Flax: Flax production is seriously limited by the inability to increase average yield per acre. Continued research on this phase of flax agronomy is recommended. There is need for exploration of germ plasm of wild species to locate genes for resistance to curly top, aster yellows, and pasmo not found in Linum usitatissimum. Also needed is a gene for windblown pollen for the production of hybrid flax and cytogenetic studies are needed to determine practical ways to transfer genes from wild species to cultivated flax.

We urge the continuation of the plant pathology work at North Dakota State University devoted to flax rust.

Tung: Basic research is needed to develop information on the reasons for biennial bearing tendency, breed differentiations, and what triggers spring growth. Additional studies are needed on dormancy, growth regulation, and chemicals that delay blossoming. Varieties need to be developed that have late blooming characteristics.

Castorbean: Research needs to be expanded to determine the best means of exploiting hybrid vigor. The basic technique has been developed but expanded studies are needed to provide improved breeding lines for the production of superior commercial hybrids with increased yield, disease resistance, and higher oil content.

Safflower: Hybrid safflower is a distinct possibility. Genetic studies of desirable characters such as thin hull, high oil percentage, and disease resistance are needed to provide inbred lines capable of producing superior hybrids. The genetics of the thin hull and striped hull characters used in hybrids is not well understood and requires further genetic and cytogenetic study.

Sunflower: Basic problems requiring expanded research include insect and disease resistance, studies of hybrid vigor, and methods of commercial hybrid production, inheritance of high oil content, and agronomic adaptation.

Sugar Beets: Additional basic research is needed on male sterility, polyploidy and interspecific crosses to utilize sources of resistance to insects, diseases, nematodes and soil organisms. Basic research should be intensified to determine the factors that influence bolting, seed germination and seedling vigor. The work on physiology of the sugar beet and its association with the factors affecting quality should be continued, along with further biochemical studies associated with disease resistance.

The increasing incidence of new virus strains is viewed with alarm in all sugar beet-producing areas. The need for early detection and causes of spread were never more pressing. The search for more resistant varieties must be continued.

Virus yellows now extend from Washington State through California and into Arizona. With such large areas affected with virus yellows and curly top virus, the need for continued research on insect vectors is greater than ever.

Continued effort is needed to develop varietal resistance to *Cercospora* leaf spot, black root, and *Rhizactoria*, which continue to plague sugar beet producers.

Sugarcane: Breeding and variety evaluation continue to offer the greatest hope to the sugarcane producer for help in solving his many problems.

All possible effort should be made to expand and accelerate this work. Basic physiological, biochemical, and genetic research are needed to provide information on desirable plant characters and the inheritance of these characters.

New techniques are needed for identifying these characters that can be used to at least make preliminary evaluations of the many thousands of seedlings that must be produced annually. Present procedures are not only expensive and not precise enough for identifying readily the many important plant characters but also take years of laboratory and field trials before final evaluation.

Desirable plant characters that must be identified are many: Those associated with high sugar content, heavy tonnage, vigorous restubbling, and good milling qualities are important to all domestic areas -- Hawaii, Louisiana, Florida, and Puerto Rico. Those characters associated with cold tolerance are most important to Louisiana and Florida. These two areas are in urgent need of new varieties that mature early, are resistant to cold damage, and are vigorous restubblers after repeated freezes and frosts. Those characters associated with resistance to insects and diseases are important to all areas. Those plant characters that make varieties more adaptable to mechanical harvesting must be identified, such as self-shedding of leaves and trash, reduction of suckering and non-brittleness. Extensive investigations are needed to evaluate the World Collection of Sugarcanes for desirable plant characters.

Studies should be continued and emphasized in connection with the breeding and variety program on nutritional requirements of various varieties.

There is immediate need for basic research by trained microbiologists on fundamental soil microbiological and mycorrhizal relationships in sugarcane.

The host range of viruses that infect sugarcane and botannically related crops should be investigated to define the interrelation of the viruses and to provide a basis for evaluating the susceptibility of new varieties.

Progress made in the study of varietal decline appears promising, however, this program should be pushed with all possible speed as this is a problem of major importance to all cane areas.

Immediate basic research by a trained physiologist should be initiated on leaf formation, function, dessication, death, and shedding as an aid to mechanical harvesting of sugarcane.

B. Weed Control

Yields and quality of crop produced continue to be influenced by weeds. The control of weeds by improved chemical, cultural, mechanical, and any combination of these practices is essential to increased production and reduced costs. Continued research is needed with respect to the agronomic, physiologicall, and

biochemical aspects of weed control in relation to the efficiency of herbicides under different soil conditions, climatic conditions, and other environmental factors. Also, residual effects of the various herbicides should be studied and new herbicides developed with improved means of application.

Oilseed Crops: Although progress has been made in making chemicals available, there is no satisfactory chemical to serve farmers' purposes in weed and grass control in soybeans, flax, peanuts, and sesame. Expanded basic and applied research is needed to develop efficient and economical chemicals to reduce annual weed and grass losses and to increase yields and quality of crops. Expansion of weed investigation work pertaining to soybeans is urged by staffing facilities now being constructed at Stoneville, Mississippi. Other important soybean-growing areas have similar weed problems peculiar to their region and additional work is needed, particularly in the southeast Atlantic and Minnesota areas.

Sugar Crops: The Committee again recommends a crash program to control weeds in sugar crops. The continued problem of farm labor supply makes it imperative that a program of this type be undertaken. The main emphasis in weed control research should be placed on grass eradication in the case of sugarcane and on broad-leaf weeds in sugar beets.

C. Nematode Control

Soybeans: In all parts of the country soybeans are attacked and injured by root-knot nematodes, root-lesion nematodes, stylet nematodes, spiral nematodes, and others in addition to the well-publicized soybean cyst nematode. Of these, only the root-knot nematodes have been studied in a preliminary way, mostly in the southern states. Research is needed to clarify the relationships of these nematodes to nitrogen nodulation and to root-rotting fungi attacking soybeans. This program should be slanted toward accumulating the information needed as a basis for a sound program of nematode control including the incorporation of nematode resistance in soybean varieties.

Sugar Crops: Nematode infestations continue to be an economic problem in all sugar crops. The resultant damage of fungi to the roots after nematode damage causes a sharp reduction in production. Basic research is needed on this relationship in order to reduce production losses.

D. Insect Control

Oilseed Crops: Research effort needs to be expanded to develop safe, modern, effective chemical control of peanut insects and to explore other methods such as biological control, attractants, chemosterilants, and the use of insect-resistant varieties.

Additional effort is needed to identify insects damaging soybeans or serving as vectors for soybean diseases and to find genetic resistance or other means of controlling their spread.

Sugar Crops: Many of the present insecticides being used are now becoming less effective as the various insects involved have become resistant to these chemicals. Typical examples are the cane borer, wire worms, and yellow aphid. New insecticides should be developed and studied in order to overcome this problem. On sugar beets effective methods of control are needed for root maggot, beet webworm, aphid vectors, and leafhoppers.

Continued work on attractants, repellants and sterilization procedures is needed and research on biological control methods should be enlarged and accelerated.

The Committee views with concern the proposed elimination of the research program at the Houma Station on the vectoring of sugarcane mosaic by insects. This program involving an entomologist working closely with a plant pathologist on a joint solution of a major disease of sugarcane is a type of interrelated research which the Committee feels is very desirable. An immediate re-evaluation of this proposed reduction should be made in an effort to retain the program.

The Committee also is concerned with the reduction of work on sugar beets at Yakima, Washington. Virus yellows is a serious threat in the entire area west of the Rockies and it is felt that the work on entomology should be continued.

E. Agricultural Engineering

Soybeans: Field shatter and combine losses during the harvesting of soybeans has been estimated at 5% on the average but in many cases losses of over 10% are experienced. Reducing these losses by improved cultural methods and harvesting equipment and techniques offers one of the best opportunities of improving efficiency and increasing the quality of the soybean crop. Also efficient harvesting, cleaning, and farm handling are the first and probably the most important phases of production from the standpoint of avoiding molds and maintaining seed quality.

Peanuts: The accelerated harvesting methods used in all the peanut-growing areas have greatly affected the quality of farmers' stock peanuts and complicated the drying and associated processes. Conventional methods of harvest not only contribute to excessive field loss but also tend to produce higher percentages of cracked hulls, damaged kernels, loose shelled kernels, and trash in the farmers' stock peanuts. Further, preliminary research results have shown that presently employed methods of drying are not satisfactory in maintaining quality nor in preventing the buildup of harmful fungi during the drying process. The Committee recommends that increased emphasis be placed on accelerating both the harvesting and curing research.

Castorbean: The development of a proper harvester for this crop has been essential to the reintroduction of castorbeans. While there are satisfactory harvesters in use, further development is needed to make a better operating machine. It is recommended that studies in this area be continued.

Tung: Mechanical harvesting machines have been developed and are now available. Now it becomes necessary that a completely mechanical integrated harvesting system be developed from ground to mill. It is recommended that this project be carried to completion.

Sugarcane: Increased costs of labor in all cane areas plus the lack of sufficient farm labor in some areas due to nonavailability of local labor and government restrictions on use of off-shore labor is threatening sugarcane producers with almost insurmountable problems in harvesting sugarcane. This Committee is pleased with the cooperation between the recumbent cane research group and the Industry Harvester Committee. This Committee, while recognizing that the project being new, has taken a long time to get staffed, obtain new facilities, and get organized, urges that a maximum effort be made to accelerate this program.

It is realized that, while both the sugarcane industry and sugarcane equipment manufacturers have been and are increasing developmental work on a harvester, there are none in sight at the present time that will satisfactorily harvest recumbent cane. Also, it is realized that developing such a machine may take years and it is entirely possible the research project on this problem may need to be materially expanded before achieving the desired goal. Mechanical harvesting research should be coordinated with utilization research in order to minimize the effect of burned and mechanically harvested cane on the processing of sugarcane.

UTILIZATION, NUTRITION, AND CONSUMER USE RESEARCH

The Committee commends the Department for its research in the field of utilization. The established commodity programs should be continued and new programs need to be directed toward basic research to obtain additional knowledge of fundamental chemical and physical properties of commodities. Also, research on chemical reactions, composition, and improved analytical methods need to be continued and expanded.

Basic Research on Mycotoxins: Current pharmacological research to determine the effects of feeding animals graded levels of aflatoxin and their metabolic fate is commended. This work should be continued and expanded.

The biological activity of mycotoxins have generally been investigated in animal systems in which they have been shown to inhibit protein synthesis. Recent research has shown that the synthesis of enzyme (lipase) in seeds can be accelerated or inhibited by varying the concentration of aflatoxin. Seeds may provide an excellent model system for study of the mode of action of mycotoxins. Intensified and expanded research to develop this potential is recommended.

Reference standards for use in analysis of aflatoxin have been made available by the Southern Utilization Laboratory on an emergency basis in response to an urgent need. Research personnel have been diverted from important research for this purpose. It is mandatory that this service be maintained on a continuing basis. Thus, addition of supporting personnel as may be required to accomplish this is strongly recommended.

Peanuts: Basic research studies on the chemistry of peanut meal and oil components as they relate to flavor, stability, and nutritive value should be continued.

Nutritious, low cost, attractive protein concentrates and food products from peanuts can fulfill a definite need both at home and abroad. Research is needed to develop acceptable defatted peanut products and techniques of incorporation of these materials into food products. Research should be expanded to determine the effects of processing on flavor, texture, nutritive value and other consumer quality characteristics.

The Committee reiterates its prior recommendations that high priority be given to the continuance of research on mold mycotoxins affecting peanuts and certain other commodities. The Committee cannot stress too strongly the urgent need for intensification of research in this area.

Soybeans, Oil and Meal: Basic research on the chemical composition and ~~properties~~ properties of oil, protein, and other constituents should be continued. Flavor stability studies on improved edible soybean oil, both hydrogenated and unhydrogenated, should be continued. Basic studies on the chemical modification of soybean oil should be increased. Studies on protein and other components of defatted, dehulled, soybeans need to be continued with increased emphasis particularly as those components related to flatus, flavor, and functional properties of soybean food products. Improved flavor and acceptability of full-fat flour as well as the development of other soybean protein products for use in foods in the developing countries and the domestic markets is desirable.

Linseed Oil: Basic studies on linseed oil in water and solvent paint systems need to be continued and expanded. Color retention and durability of paint films, pigment interaction and emulsion stability, improved mildew resistance and adhesion to wood and other surfaces, the effect of pigments and driers on paint properties are desirable areas for further investigation.

Expansion of basic and exploratory research on chemical modification to find new derivatives or better methods for making useful products such as conjugated oils, metallic complexes, and new coatings needs to be continued. Increased emphasis should be placed on basic studies on the use of linseed oil as a joint curing and antiscaling agent for concrete. Superior linseed oil compositions and methods of application need to be developed to permit proper curing of concrete under adverse conditions and still impart antiscaling properties to concrete.

Tung Oil: Fire-retardant coatings are of extreme importance to the Nation. The fire-retardant coating developed from tung oil shows promises. Research on further development of such fire-retardant coatings should be reinstated.

Castor, Safflower and Other Western Oil Seeds: Basic and applied research on chemical composition, chemical modification, and promising new uses for castor and safflower should be continued. Fundamental compositional data on proteins, carbohydrates, and other constituents of these oilseed meals should be obtained and utilized in improving animal feeds or edible products. Special attention should be directed to development of in vitro tests for castor allergens and to identification of odor and flavor constituents in safflower seed.

Replacement Crops: Screening and characterization of potential replacement crops continues to have importance in agriculture and should be kept active, provided they do not compete with existing crops. Basic chemical studies and industrial usage programs on erucic oils and acid have shown progress and should be maintained. Basic protein studies of these crops also require continued investigation.

Sugar Crops: This Committee urges again that utilization research on both sugarcane and sugar beets be reinstated and expanded. The Committee also views with alarm that utilization work on production of sugar from sweet sorghum is to be continued while much needed research on both sugarcane and sugar beets has been discontinued. With the scarcity of both personnel and funds, it appears illogical to continue utilization research on a new source of sugar that, if successful, could only result in displacing present sugar crops that have already been seriously cut back in acreage.

Utilization work on sugar crops should be a joint effort of industry and government and the Committee feels that the Department and industry should explore the possibility of setting up jointly financed programs to work on the following problems:

Continuation of and expansion of compositional and biological studies of changes occurring during postharvest storage of sugar beets.

Research should be continued on isolation, identification, and development of methods for determining nonsucrose chemicals in beets and the effects of conventional or new purification processes on their elimination.

The impending complete changeover to mechanical harvesting will materially increase the nonsugar components in sugarcane juices and impose a serious burden on the sugarcane producer. Lower recovery of sugar from their juices will in turn reduce income to the sugarcane producer. Basic research should be reinstated on the components of sugarcane juices to develop processing methods capable of handling burnt and mechanically harvested cane.

Research should be conducted involving new uses other than food for both sugar and byproducts.

Nutrition and Consumer Use: The Committee was impressed with the need for continued support of basic work in human nutrition, not commodity-oriented, which can benefit all involved in agriculture.

Periodic large-scale surveys of food consumption of households and individuals along with smaller, special purpose studies should be encouraged.

Research leading to tables of food composition such as Agricultural Handbook No. 8 should be given continued support as needed to keep them up-to-date and to include all nutrients important in nutrition for which there are sufficient data.

The basic studies on the effect of all agricultural chemicals on nutritive quality and consumer acceptance should continue.

MARKETING AND ECONOMIC RESEARCH

Economics of New Products and New Uses: The Committee recognizes the importance of new products and new uses in promoting economic growth, increasing returns, and improving agriculture. Economic research on the potentials for new products and new uses should be continued and strengthened to assist industry in the commercial application of technical advances in the products of agriculture.

Proposed Publication on Agricultural Marketing: The Committee recognizes the need for the comprehensive report on agricultural marketing to be published and believes that it will be of great value for informing producers, the marketing industries, and the public of the scope of agricultural marketing and its importance to the Nation's welfare and growth.

Institutional Food Market Study: The Committee commends the work underway to develop information on the markets for food in institutions. The importance of this market has increased greatly and the data to be supplied through this study will aid producers and processors of agricultural products as well as marketing firms in supplying its needs.

Soybeans: Market quality research is needed to ascertain the user and market values of the different grades of soybeans including broken particles now treated as foreign material.

Information on soybean processing costs by different methods needs to be updated to provide guidelines for improving efficiency. Corollary data on the comparative advantages of different methods of oil extraction are also needed to evaluate their effects on oil supplies and prices and returns to growers and processors

Peanuts: Protection of stored peanuts against insect damage is a serious problem.

Insects, and the damage they cause, are one of the major factors in loss of quality of peanuts. The Committee is alarmed at the increasing number of reports on the failure of malathion to control insects in stored peanuts, and at the indications of the development by insects of resistance to malathion. The Committee urges increased efforts be made on: (1) the development of a new protective treatment to replace malathion, (2) the practical evaluation and development of low oxygen-carbon dioxide or nitrogen atmospheres, and (3) research on the biology and ecology of the insects that infest peanuts during storage.

It is recommended that intensive and concentrated research be directed towards the exploration of new concepts that will result in the development of new and better equipment for shelling farmers' stock peanuts. Forces of impact, vibration, and abrasion developed by shelling machines currently in use affect peanut quality and economics of operation. Currently, only a minor effort is being devoted to this problem at the shelling laboratory at Dawson, Georgia.

Better methods of sampling peanuts are needed. In the past few years mechanical and pneumatic samplers have been introduced for official sampling of farmers' stock peanuts. Recent experience with these methods of sampling have raised some questions with respect to their accuracy and efficiency. In particular, the possibility that shelling of farmers' stock peanuts may occur during the sampling operation and destroy the representativeness of the samples needs investigation. Research should be expanded to improve the performance and accuracy of present methods or develop new methods and equipment for obtaining samples that will be representative of a given lot with respect to both usual grading factors and also mycotoxin content.

Sugar Substitutes: The Committee is gratified that marketing studies have been started on the relation of cyclamates and other synthetic sweeteners as substitutes for sugar. This research should be continued to determine the impact of these synthetic sweeteners on the domestic sugar industry.

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UNITED STATES DEPARTMENT OF AGRICULTURE
Research Program Development and Evaluation Staff
Washington, D. C. 20250

REPORT AND RECOMMENDATIONS

of the FOURTH MEETING of the

OILSEED, PEANUT AND SUGAR CROPS RESEARCH ADVISORY COMMITTEE.
Belle Glade, Florida January 23-26, 1967

MEMBERSHIP OF THE COMMITTEE

Franklin A. Beale, Executive Vice President,
Central Aguirre Sugar Company, Aguirre, Puerto Rico

Chester A. Biddle, Farmer, Remington, Indiana

John B. Boy, Executive Vice President, United States Sugar Corp.,
Clewiston, Florida

Dr. Reynold P. Dahl, Professor, Department of Agricultural Economics,
Institute of Agriculture, University of Minnesota,
St. Paul, Minnesota

Jacob Hartz, Jr., Manager, Hartz Seed Company, Incorporated,
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Gordon H. Miller, Farmer, Grandview, Washington

Dr. John F. Murphy, Vice President, Swift and Company,
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Jabus B. Roberts, President, Dothan Oil Mill Company,
Dothan, Alabama

Davis L. Sunderland, District Manager, Northern Ohio Sugar Company,
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Hassell Thigpen, Farmer, Tarboro, North Carolina

Elvin A. Walker, Farmer, De Leon, Texas

Aaron S. Yohalem, Senior Vice President, Corn Products Company,
New York, New York

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PREFACE

The fourth meeting of the Oilseed, Peanut and Sugar Crops Research Advisory Committee was held at Belle Glade, Florida, January 23-26, 1967. Assistant Secretary George L. Mehren, Chairman of the Committee, was unable to attend. He was represented by Dr. W. Dayton MacIay, Director of Research Program Development and Evaluation Staff, for administrative and budgetary matters. Dr. Sam R. Hoover, Assistant Deputy Administrator, Agricultural Research Service, Vice Chairman of the Committee, presided. All committee members except Dr. John F. Murphy were present.

During the public session on January 23 representatives of the following organizations presented statements pertaining to research needs:

Southeastern Peanut Association	- John W. Greene, Executive Director
North Carolina Peanut Growers Assn.	- Joe S. Sugg, Executive Secretary
National Flaxseed Processors Assn.	- C. E. Morris, Director of Research and Development
Industry Sugarcane Harvesting Comm.	- John Boy, Vice President, U. S. Sugar Corporation
Beet Sugar Development Foundation	- George E. Rush, President
National Soybean Crop Improvement Council	- Robert W. Judd, Managing Director
Research Council of the National Soybean Processors Assn.	- Philip D. Aines, Chairman
American Soybean Association	- George M. Strayer, Executive Vice President & Secretary-Treasurer
American Tung Oil Association	- Roland R. Becke, Executive Secretary

The representative of the Southwestern Peanut Shellers Association, Sydney C. Reagan, general counsel, was unable to attend and forwarded a statement which was submitted to the Committee.

On January 24 the Committee, several representatives of organizations, and USDA personnel participated in a local tour to observe research aimed at developing a mechanical harvester that would handle recumbent sugarcane. Machines developed by local plantations and machinery companies were observed as well as research at the USDA Sugarcane Harvesting Laboratory in Belle Glade. The tour also included research at the USDA Sugarcane Field Station at Canal Point pertaining to breeding, entomology, diseases, and variety testing; and the Glades Sugar House, a sugar mill operated by the Sugar Cane Growers Cooperative of Florida.

As a basis for its recommendations the Committee reviewed research progress reports which were supplemented by oral reports, visual materials, and discussions by leaders of research programs. Following these reviews and discussions the Committee divided into subcommittees. All subcommittee recommendations were reviewed by the entire committee before they were approved for inclusion in the final report to be submitted to the Secretary of Agriculture.

Additional copies of this report may be obtained from Max Hinds, Executive Secretary of the Oilseed, Peanut and Sugar Crops Research Advisory Committee, Research Program Development and Evaluation Staff, U. S. Department of Agriculture, Washington, D. C. 20250

OILSEED, PEANUT AND SUGAR CROPS RESEARCH ADVISORY COMMITTEE

REPORT AND RECOMMENDATIONS

GENERAL COMMENTS AND RECOMMENDATIONS

The Image of Agricultural Research

The Committee commends the Department of Agriculture and its dedicated research workers for the energy and cooperation that has been set forth in helping achieve the goals and targets established by the Agricultural Research Advisory Committees. The broad base of fundamental science developed over the years with limited inputs from industry is being moved forward each year by these public spirited members of the Department. In recognition of the need for continuously attracting such personnel, the Department must constantly strive to improve its image before the general public and must succeed in having the general public recognize it as containing within its structure an important research arm of the Federal government.

Assistant Secretary for Science

For the reasons stated above and because of the worldwide critical importance of the specific research programs of the Department -- with their scientifically based efforts and the nutritional and economic contributions emanating as a result of such programs -- it is recommended that the Secretary recommend to the Congress that such legislation be enacted establishing an additional Assistant Secretary position in the USDA for Science and Education.

Personnel Policy

In order to provide maximum efficiency in the procurement, retention and development of scientists -- promotions within the Department should be made in accordance with ability and responsibility without regard to numbers within a particular grade, and with particular emphasis on accomplishments in the respective field of endeavor whether shown by publication or acceptance and use by industry.

Research Coordination and Planning

The Committee commends the Department and the Association of State Universities and Land-Grant Colleges for the comprehensive and thorough study of agricultural research which was recently published. The report entitled a National Program of Research for Agriculture is the most complete analysis of agricultural research undertaken to date. It should be of considerable value in coordination and programming research in an expanding complex. Improved coordination of research among the State Agricultural Experiment Stations and between the U.S. Department of Agriculture and the State Stations is essential. Foreign research under P.L. 480 funds must also be coordinated with the overall research program in the United States. The Committee supports the establishment of scientist task forces composed of Federal, State and industry representatives to analyze in depth research needs in different areas of subject matter, and further that the Research Advisory Committees of the USDA review such recommendations of the task forces. The Committee also proposed that they review the related work of the Land-Grant Universities.

World Food

The world food problem is upon us. The Food for Freedom legislation enacted last year pledges our Nation to aid in its solution. We have undertaken to work with all nations which embark upon a program of self-help. This program unquestionably has changed our Nation's agricultural supply from one of surplus to one of adequacy. Thus, the programming of new projects must be more closely examined both from the standpoint of the inherent value to both American nutrition and nutritional needs abroad. The economics of such a program must be carefully analyzed. The Committee recommends high priority for expanded research in this area and to such continued agronomical research on the important world food and feed crops.

Because agricultural land expansion may be soon reaching its saturation point, yields per acre become the critical factor. Yields of the future will be the result of research-based management practices. Fertilizers, insecticides, pesticides, and rodent controls become the tools needed for expanding the production of highly nutritious protein-rich foods, and thereby helping to solve the world food problem. Expanded research efforts that will provide (1) nontoxic materials, and (2) residual tolerance data are of the highest priority.

Facilities

It is recommended that the Department do everything in its power to speed construction of the National Peanut Laboratory at Dawson, Georgia, fully equipped and fully staffed in accord with its original plans.

The Committee strongly recommends that the sugar beet research laboratory approved for construction at Fort Collins, Colorado, be let for construction in the immediate future. In view of the pressing problems that must be solved for a more efficient sugar beet production, this facility is desperately needed.

FARM RESEARCH

In areas of farm research, the Committee recommends that wherever possible and advisable research be conducted in the area where the particular problem is most critical.

A. Culture, Breeding, Diseases and Variety Evaluation

Soybeans: Reference was made in a general recommendation to world food needs.

Protein and oil are two items in great demand which provide opportunity for increased soybean production. Future yields on limited agricultural land was cited as a critical factor.

Inadequate yields per acre. Higher per acre average yields of soybeans are necessary to hold present soybean acreage and continue the expansion of acreage needed to meet the increased demand for protein. Additional effort is needed to identify specific biological or environmental factors limiting yield. Present work on soybean-bacteria relationships affecting nitrogen fixation efficiency should be continued and expanded. Techniques are needed to establish a new strain of bacteria in fields where soybeans have been grown; more detailed study of germ plasm is needed to identify desirable traits for use in breeding such as disease resistance, improved nutrient response, and male sterility. Research is needed now to discover or develop these and other genetic traits and to find means of incorporating them into good agronomic types. Progress in variety development depends on the amount of material evaluated. Regional variety evaluation should

be increased with special attention to development of varieties specifically tailored to local conditions.

Ecological, cultural, and management factors that limit yields are not well understood. Water supply -- including excesses and deficiencies, races, timing, and other related factors -- is obviously critical, but data necessary for quantitative and effective control of water relations is virtually nonexistent.

Studies are needed by field agronomists and physiologists specifically directed toward combining all factors for maximum yield level in each major area of production.

Improvement of chemical composition. Research should be intensified to develop varieties combining high yield, high oil, and high protein with good agronomic qualities. Recent research on other crops, e.g., corn, rapeseed, and safflower has shown the possibility of finding a strikingly different chemical composition within a species. Present screening and other work to seek a low or zero linolenic acid line in the germ plasm bank or in soybean relatives should be greatly accelerated. Similar screening of the germ plasm for improved amino acid composition should be initiated. An increase in methionine content would improve the amino acid balance and thus substantially extend the usefulness of soybean protein in meeting world food needs.

Soybean disease control. Brown stem rot, stem canker, and the complex of diseases and environmental factors responsible for poor seed quality are not likely to be eliminated by plant breeding. These and other diseases must be conquered with additional pathology research. In addition to plant breeding and genetic effort listed previously, research is needed to find alternate control measures for the above diseases. All aspects of brown stem rot transmission and infection and the mechanism of pathological action must be identified. Chemical, cultural, or other means of controlling the disease must be found. Specific and increased attention is needed for the disease complex related to seed quality which is a major problem in the lower midwest, upper Delta, and middle Atlantic areas. Practical measures for controlling seed quality and for preventing poor seed quality in the field are urgently needed. The abnormal physiology of diseased plants has had only limited study, yet such research may provide important information for solution of brown stem rot and other diseases. Intensive study should also be made of transmission of viruses and other diseases, including control measures necessary to eliminate insect vectors.

Peanuts: The Committee wishes to commend the Department for the increased level of work on peanut problems. Considerable progress is being made. However, some areas are of such a critical nature that work toward their solution should be accelerated immediately.

Mold and mycotoxins on the farm. It is felt that enough research progress has been made that an all-out effort would soon lead to a successful solution to this problem. The most critical time for peanut quality deterioration and mold growth occurs between digging and storage. In this period, the peanut is subjected to mechanical damage, to adverse environmental conditions, and temperature and moisture stresses. Studies of these factors are presently underway in the Virginia-Carolina and southeast production areas. This research should be intensified in the two eastern areas and extended to include studies in the southwest area where the soil and climatic conditions are very different. All of the research underway on molds and mycotoxins should be continued toward the solution of the problem.

Pesticide residues. The problem of pesticide residues is critical, particularly where peanuts are grown in rotation. This includes insecticides, fungicides, weedicides or any other agricultural chemicals. Research should be expanded and intensified to cover all these fields.

Stunt virus. Research on peanut stunt virus should be accelerated by all possible means. No easy or quick solution is yet in sight but this disease is potentially so costly that additional research is urgently needed. Virus or a virus complex involving peanuts and a number of other host crops as clover, snapbeans, and wild host plants has become an alarming problem threatening production of the crop.

Management factors. Research is needed to identify factors that could be used in determining the maturity of peanuts and the relationship of maturity on flavor and roasting. Use and management of water is a critical problem in peanut production and should be studied to determine the influence on growth, diseases, nematodes, and cultural and handling practices in all areas.

Castors: Research needs to be expanded to determine the best means of exploiting hybrid vigor. The basic technique has been developed but expanded studies are needed to provide improved breeding lines for the production of superior commercial hybrids with increased yield, disease resistance, and higher oil content.

Safflower: Hybrid safflower is a distinct possibility. Genetic studies of desirable characters such as thin hull, high oil percentage, and disease resistance are needed to provide inbred lines capable of producing superior hybrids. The genetics of the thin hull and striped hull characters used in hybrids is not well understood and requires further genetic and cytogenetic study. New research is needed on the response of safflower to environmental factors, especially under arid conditions where irrigation is unavailable.

Crambe: The Committee notes and endorses the development of crambe as a new oilseed crop and recommends production research on this crop in the areas where it is adapted.

Tung: Research is urgently needed to provide late blossoming. Breeding late varieties or chemical control of blossoming are avenues to this end. Studies of factors affecting productivity, especially the tendency for a lighter crop to set in alternate years are needed.

The Committee recognizes and shares industry concern over the attrition of the tung research staff. We recommend continued vigorous recruiting to obtain the scientists needed to bring the tung research staff to full strength.

Sugar Beets: It is agreed that the overall research needs today are greater than at any time in the history of the beet industry. In spite of progress made in sugar beet production and processing, urgent problems remain to be solved. Therefore, we urge the Department to intensify its research efforts in solving the following problems of the beet sugar farmers.

New varieties needed. More research is needed on male sterility, polyploidy and interspecific crosses to utilize sources of resistance to insects, diseases, nematodes and soil organisms. The search for resistance to virus strains, especially virus yellows and curly top, should be uninterrupted and strengthened to assure the earliest possible incorporation of resistant characteristics into

commercial varieties. Cercospora leaf spot, black root and Rhizoctonia continue to plague the beet farmers. These specific problems should be reviewed with plant breeders each year.

Sugarcane: Research on breeding and variety evaluation should be expanded and accelerated. Many desirable plant characters must be identified and their inheritance determined. Physiological, biochemical, and genetic research are needed to develop techniques for identifying these characters and to speed up the selection of superior cane varieties. Current breeding methods used with sugarcane require large progeny population. The present procedure is expensive and is not precise enough for identifying readily the many important plant characters.

Extensive investigations are needed to evaluate the more than 4,000 varieties in the world collection of sugarcane for desirable plant characters. Every effort should be made to widen our present base of crossing to bring in new germ plasm.

Basic research by a trained microbiologist should be initiated on fundamental soil microbiological and mycorrhizal relationships in sugarcane. Research should be continued on determining nutritional requirements of various varieties in connection with the breeding and variety program.

All domestic cane areas need varieties with higher sugar content, heavy tonnage, vigorous restubbling and good milling qualities. Development of cold tolerant varieties is still the most urgent need in Louisiana and Florida. Plant characters associated with resistance to insects and diseases are important to all areas. All promising new varieties developed in each of the cane areas should be screened in advance for their susceptibility to all major cane diseases even though some do not now occur in major areas in the event these diseases should spread. Introduction of varieties with desirable plant characters from one area to another should be continued for evaluation purposes.

It is increasingly important that desirable plant characters with respect to mechanical harvesting be identified such as early maturity with a minimum of immature top present at harvest, self-shedding of leaves, reduction of suckering and nonbrittleness.

Diseases of Sugarcane. Information is needed about the relationship between virus diseases of sugarcane and virus diseases of corn, sorghum, and related crops. Sugarcane mosaic will infect maize, sorghum, and some other grasses. The host range of viruses that infect sugarcane and botanically-related crops should be investigated. Serological, chromatographic, and other improved techniques should be used to define clearly the interrelationship of the viruses and to provide a basis for evaluating the susceptibility of new varieties.

Under the stress of greatly stepped-up efforts to test different mechanical harvesters the movement of harvesting equipment from one cane area to another has introduced a serious need for proper coordination of this work with plant quarantine procedures and measures. The Committee recommends that the Department initiate precautionary measures to prevent the spread of serious bacterial virus and fungus diseases of sugarcane, as well as the possible dissemination of insect pests and weeds through the transfer of equipment.

B. Weed Control

In the development of future weed, insect, disease and nematode control measures involving pesticides and herbicides, increasing attention must be given to principles of application that avoid or minimize residues. Particular concern is the carryover of pesticides in the soil which may damage or cause undesirable residues in succeeding crops.

Cooperation between farmers, scientists and industry in developing pest control measures should be strengthened. Many pest problems are interrelated. For example, weeds harbor insects that attack crops or transmit diseases to crops, they serve as alternate hosts of disease organisms and nematodes. Also, nematodes are implicated in several important problems. Research is needed to:

1. Develop new principles and economical measures for controlling weeds and grasses in sugarcane and sugar beets. Successful mechanization of the sugar beet crop is impossible until some effective control is obtained on both broadleaf weeds and grasses. Grass eradication in sugarcane continues to be the major weed control problem due to the susceptibility of sugarcane to damage from herbicides effective on grasses.
2. Develop safe and economical measures for controlling weeds and grasses in soybean fields, especially in the lower Mississippi Valley and the Atlantic coastal area.
3. Develop safe and economical measures for controlling weeds and grasses in peanuts in all producing areas.
4. Develop basic information on the physiology, ecology, and botany of troublesome weeds so as to develop new approaches to the control of weeds in sugar, oilseeds and peanut crops. Initiate studies to select chemicals that would sterilize the seed produced by grasses and broadleaf weeds to control subsequent infestations.

C. Nematode Control

Breeding programs with soybeans have been highly successful in developing resistance to the soybean-cyst nematode and to root-knot nematodes, but resistance to sting, root-lesion, and reniform nematodes is difficult to obtain.

In all peanut-producing areas reduced yields and crop losses from these pests and diseases are extremely high. There is immediate need for basic and applied research on nematodes and their probable relationship to such diseases as Southern blight, stem and pod rots, leaf spot and molds.

In sugar crops the extent of damage by nematodes is not known except that serious economic losses occur. Studies are needed on nematodes in sugar crops to determine the extent of damage and their relationship to soil pathogens and modes of control.

Chemical control offers the best means of controlling these destructive nematodes. Therefore, research should be expanded to develop low-cost effective methods of controlling nematodes with nematocides. Chemical control studies should be part of an interdisciplinary approach to integrated control of nematodes, weeds, pathogenic soil fungi, and insects, supported by competent agricultural engineering know-how.

D. Forecasting Disease Epidemics

Recent epidemiological research has resulted in development of accurate methods of forecasting certain downy mildew disease epidemics. There is need to expand this research program to establish techniques, including remote sensing, for predicting disease epidemics of sugar, soybean, peanut and other oilseed crops. Cercospora leaf spot of sugarbeets and peanuts should receive high priority.

E. Insect Control

Because of increasing problems with insect resistance and pesticide residues, the Committee feels that research effort needs to be greatly expanded to develop safe, modern, effective chemical control of insects and to explore other methods such as biological control, attractants, repellants, chemosterilants and the use of insect-resistant varieties. It is imperative that new and safer insecticides be developed that will not result in pesticide residues in the soil, harvested crops, or products from these crops.

For sugar beets, more effective methods of control must be found for root maggot, beet webworm, aphid vectors, and leafhoppers and wireworms. On sugarcane, wireworms have become a major problem in recent years due to the development of high resistance to aldrin. Other insects which have developed similar resistance to pesticides are the cane borer and the yellow aphid.

There is need for intensive fundamental research on arthropod vectors associated with the overwintering hosts, spread, and transmission relationships of these diseases in order that control recommendations can be developed.

F. Agricultural Engineering Problems

The entire field of equipment for the planting, production, harvesting and storage of sugar beets, peanuts, and soybeans should be reviewed. The possibilities of development of equipment specifically designed for each such crop should have major attention from the engineering, agronomic and marketing standpoints.

Engineering research is needed in developing both equipment for precision application of herbicides and for the mechanical or cultural control of weeds.

Soybeans: The soybean crop today is planted, cultivated, harvested and handled with equipment which was designed for use in other crops. There is great need for planting equipment for soybeans which will handle the seed gently and will space the beans evenly and uniformly in the row. The combine used in soybean harvesting does an inefficient job of gathering the crop with estimated field loss as much as 10%. Major damage to the soybean itself is evidenced by broken or cracked beans.

Peanuts: All phases of mechanical handling of peanuts need to be reviewed and improved to insure less damage. Further research is needed on digging and harvesting machinery to reduce field losses, lessen damage and to produce better quality peanuts. Quality of the harvested product should be kept in mind. The possible development of a new type of nut-vine separation should be investigated. A special type of machine for harvesting seed peanuts is needed.

Sugarcane: The Committee again recognizes the urgent need for the development of a sugarcane harvester that will satisfactorily harvest recumbent or lodged cane. High labor costs along with disappearance of farm labor in all domestic sugarcane areas make this a problem that must be solved.

Removal of tops, leaves, trash, and extraneous material is a corollary problem that must be solved. Louisiana and Florida have the additional problem of removal of immature and frozen tops. The present contract research project for removal of tops and trash is highly commended and should be continued and accelerated.

UTILIZATION, NUTRITION, AND CONSUMER USE RESEARCH

The Southern Regional Research Laboratory is commended for having furnished the reference standards for use in analysis for aflatoxin in response to an urgent need. It is essential that this service be maintained.

Basic Research on Mycotoxins: The Committee reiterates its prior recommendations that the highest priority be given to the continuance and intensification of research on mold mycotoxins affecting peanuts and certain other commodities, and that the funds required for this priority be made available. The Committee cannot stress too strongly the urgent need for research in this area. This should include investigation of the occurrence, origin, detection, effects and control of fungi, in addition to A. flavus, and toxic fungal metabolites in peanuts and other agricultural commodities and their processed products. Research on aflatoxin should be intensified more fully to establish its chemistry and behavior under various conditions and its mode of formation and of action, for example, by use of labeled compounds. Genetic factors which make one strain of A. flavus toxigenic and another nontoxigenic should be investigated as a knowledge of genetic variation might provide a clue to prevention of toxicity even though the mold is growing on natural substrates.

The beet sugar industry views with alarm the potential threat to its most valuable byproduct, dried molasses beet pulp, from possible development of harmful mycotoxins during storage. Accordingly, it is strongly recommended that the research on mycotoxins currently being conducted by the Department be expanded immediately to include sugar beets and sugar beet byproducts.

Peanuts and Their Products: A process has been developed to produce partially defatted peanuts by mechanically expelling the oil and reconstituting the peanut. Although a highly acceptable peanut product is provided, research should be expanded to determine the effects of processing on the flavor, texture and nutritive qualities and to develop attractive new high protein products to increase consumer acceptance and extend markets.

Basic research studies on the chemistry of peanut meal and oil components as they relate to flavor, stability, and nutritive value should be continued. Research on the development of objective methods for the evaluation of characteristic flavor of roasted peanut products should be initiated.

Research should be expanded to develop a process for the production of peanut flour from raw and/or roasted peanuts to furnish a high protein dietary supplement with controlled amounts of oil for both domestic and foreign use.

Research should be initiated to develop methods for evaluating available and bound methionine and threonine and to explore the effect of peanut processing conditions on the availability of these and other essential amino acids.

Soybeans, Oil and Meal: Basic studies on the chemical composition of soybeans and derived products, particularly oil, meal and other protein products as related to properties and use should be continued. Research on methods of improving the flavor stability of soybean oil for both domestic and foreign markets should be increased with special emphasis on eliminating linolenic acid. Basic studies on the mechanism of flavor deterioration of both unhydrogenated and hydrogenated oil need to be carried out. Work should be continued on the modification of soybean oil with emphasis on new derivatives, economic procedures and evaluation of products for potential utility. Research on protein and other components of defatted and dehulled soybeans needs continued work with increased emphasis on those components related to flatus, flavor and functional properties to give superior products. Studies are needed on cellular structure of soybeans and on soybean protein products to give information of value for making foods with improved flavor, acceptance, or tailored to specific needs for domestic as well as foreign markets.

Linseed Oil: Studies should be continued on basic research related to emulsion and conventional oil base paints to improve their utility. The search for new derivatives of linseed oil should be emphasized to find economically important products. Basic and practical studies on the use of linseed oil compositions for curing of concrete as well as for protection against freeze-thaw cycles, salt and abrasion needs to be continued.

Castor, Safflower and Other Western Oilseeds: Research should be continued or strengthened on the composition of castor and safflower seed, oils, and meals, with particular attention to components that affect color, odor, flavor, nutritional value, and physiological activity, thus providing information urgently needed for the development of salable products from these crops. Recognizing present and future world needs for nutritious, palatable, and toxin-free products, additional emphasis should be given to the economical preparation of materials such as deallergenized castor meals, low-fiber safflower products, and high-value feeds from these oilseeds. Economically promising areas of safflower and castor oil chemical modification should be pursued to provide needed market growth.

Replacement Crops: Screening and characterization of potential new oilseed crops need to be continued with emphasis on nutritionally important components. Economic feasibility of new crops should be reviewed before developmental studies are initiated. Studies on chemical modification and potential industrial utility of crambe and other agronomically suitable oilseeds need to be continued. Ways to enhance the meal and protein value of these oilseeds require continued study.

Sugar Crops: The Committee still feels that utilization research work in production of sugar from sweet sorghum should not utilize funds and personnel urgently needed on established sugar crops. Development of a new sugar source could only result in displacing the established sugar crops, sugar beets and sugarcane.

The elimination of all utilization research on sugar beets and sugarcane was a definite blow because basic research is urgently needed and should be immediately initiated on isolation, identification, and development of methods for determining nonsucrose chemicals in sugar beets and sugarcane process juices and on the effects of conventional or new and improved purification processes on their elimination. This research is becoming increasingly important because of the

biological changes occurring during long postharvest storage periods of sugar beets. The successful development of a mechanical sugarcane harvester will depend upon the mill to handle the additional extraneous nonsucrose containing material and process the cane to make sugar. Entirely new processing methods may be required to eliminate increasing amounts of nonsugars and give the maximum economical recovery of white sugar.

Research should be initiated on more profitable utilization of the byproducts of sugar beet and sugarcane processing, including molasses, bagasse, and beet pulp. The Committee believes that it is a serious loss of potentially valuable agricultural fiber to burn bagasse as fuel. Beet pulp contains potentially valuable carbohydrate polymers and successful research might provide a greater return for pulp than its present value as cattle feed. Research is also urgently needed to develop nonfood, nonfeed materials from sugar beets, sugarcane and sugar.

Nutrition and Consumer Use: Studies are needed on fat and sugar metabolism, taste perception and food preferences, and the form of minerals in foods. Nationwide food consumption surveys should be established at biennial intervals, covering age-sex groups.

ECONOMIC AND MARKETING RESEARCH

The Committee recommends that the resources devoted to economic and marketing research be expanded. Economic feasibility studies are needed to provide guidelines for production and utilization research efforts devoted to both existing crops as well as new crops. For example, it is important to know the potential trends in long-run demand for vegetable oils relative to protein meal for both food and feed. Also, information is needed on the price competition and economic interchange of various industrial and food oils. Marketing research in foreign markets for U.S. farm products also needs greater emphasis. Marketing practices that work in our domestic market are frequently unsatisfactory in foreign markets.

Sunflower Seed: A specific need exists now for an economic feasibility study on sunflower seed to determine whether research on sunflower breeding should be undertaken.

Peanuts: Freshly dug peanuts are high in moisture content and extremely sensitive to spoilage and many influences which may adversely affect quality. Research on equipment and handling procedures should be accelerated to provide information on the most desirable means of (1) cooling the peanuts as promptly as possible, as by chilling, (2) reducing the moisture to a safe level, and (3) holding under controlled atmosphere without adversely affecting processing characteristics and quality.

Research begun last year on new and better equipment for shelling farmers stock peanuts should be continued and broadened to include a determination of the causes of splitting and means of prevention.

A study is needed to determine the feasibility and methods of shipping shelled peanuts in bulk under both refrigerated and nonrefrigerated conditions.

There is urgent need to develop means of recognizing lots of farmers stock peanuts that are contaminated with aflatoxin. Currently a lot of contaminated peanuts can be commingled with clean lots because a suitable detection system

is lacking. Research should be initiated and an intensive effort should be directed to develop a rapid means of detection that can be applied at the point of first inspection.

No mechanical samplers are available for use with shelled peanuts. Research should be initiated to develop sampling systems suitable for farmers stock and shelled peanuts that will be suitable both for research and regulatory purposes. Development of these sampling systems should include determination of appropriate size and frequency of sampling and accessories such as choppers and blenders to yield reproducible and accurate results for determination of quality factors as well as aflatoxin content.

Insect attack is one of the major factors in loss of peanut quality during storage, and insects are developing resistance to the malathion protective treatment now used. Research should be increased on: (1) The development of safe, effective insecticide treatments that will avoid undesirable residues and acquired resistance, (2) the development of biological and physical methods for preventing and controlling insect infestation in stored peanuts, and (3) the biology, ecology and behavior of the insects that affect stored peanuts. Increased effort is needed on the practical evaluation and development of low-oxygen atmospheres, using carbon dioxide or nitrogen.

Soybeans: Protein and oil content are important factors determining the value of a bushel of soybeans. Soybeans are not bought or sold throughout the marketing system on the basis of either protein or oil content. Quick and accurate tests are not available for either protein or oil content for determination by the user. Research should be initiated to develop simple and quick tests for both protein and oil content that can be applied at all levels of the marketing system starting at the country elevator.

Sugar Beets: Sugar beet roots stored for long periods of time awaiting processing continue to remain alive at the expense of sugar stored in the roots. The rate of sugar loss by the process of respiration can, in part, be reduced by lowering the temperature of the storage piles. Experience in other crops requiring storage has shown that inert gaseous environments have significantly reduced respiration rates. These successful practices should be extensively examined to determine their chemical application to sugar beet storage. Other studies of physical methods to improve storage conditions should not be curtailed.



